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Indo-Soviet Joint Monograph Series

INTERACTION BETWEEN INDIAN AND CENTRAL ASIAN SCIENCE AND TECHNOLOGY IN MEDIAEVAL TIMES

VOLUME II

Medicine, Technology, Arts & Crafts,
Architecture and Music

INDIAN NATIONAL SCIENCE ACADEMY
BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002

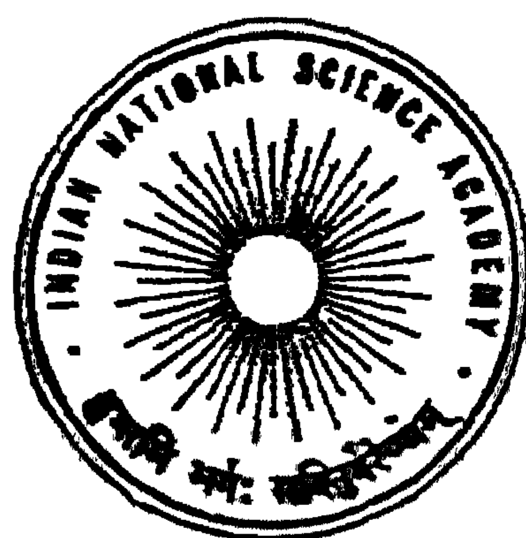
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FOREWORD

The Indian National Science Academy and the Academy of Sciences of the USSR have had a very close and fruitful cooperation in different fields of science and technology since 1975. We are happy that this cooperation has been also extended to the History of Sciences. The first Indo-Soviet bilateral seminar on this subject was held in 1981. This was concerned with the scientific and technological exchanges between the Soviet Central Asia and India during the mediaeval period. The conference was very successful and its proceedings were published in 1985. The Indo-Soviet Panel on the History of Science of INSA had a joint meeting with representatives of the Soviet delegation on November 10, 1981. It recommended the publication of a series of joint volumes in the historical development of different sciences during the mediaeval period. It was suggested that half the contributors to these volumes may be experts from India, with the other half coming from the Soviet side. This joint venture was expected not only to enrich literature on the History of Science and Culture, but to also create a climate of mutual friendship. A well documented account of the integration of human endeavour and experience will add to the bonds of friendship that exist between the two countries.

We are very happy that this joint effort has led to the publication of two volumes. They cover General Ideas & Methodology, Astronomy, Mathematics, Physical Concepts, Medicine, Technology, Arts & Crafts, Architecture and Music. We hope that the volumes will inspire others to initiate similar activities and collaborative effort in the years to come.

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PREFACE

The Central Asia or the Middle Asia is an ambiguous region in the sense that its frontiers have never been well defined. It is often used to describe the wide territory, with great varieties of altitudes, climates and habitants bounded by the Caspian Sea in the west to the Great Wall of China in the east, Siberia in the north, and Iran, Afganistan, Mongolia, Tibet, Sinkiang and Indian subcontinent in the south. In the ancient and mediaeval times the so-called political boundaries of Central Asia shifted from time to time but they had little relevance while considering movement of the people and ideas over the centuries. This region witnessed, from the earliest times, the migration and march of varied groups of people.

They exchanged knowledge, found ways for trade, cultural and scientific exchanges, and also fought for political supremacy. In the process they left behind material evidence of their attainments and failures. The vicissitudes of devastating wars, especially the relative isolation of some countries in the past, prevented science from spreading, and knowledge acquired by such countries from flowing into the ocean of knowledge common to all mankind. Recent researches by the Soviet archaeologists have revealed, on the basis of certain typographical affinities, similar situations in the old Stone Age Chalcolithic Culture.

The outstanding creations of antiquity, the Vedas and the Avesta, the former developed in Indian soil and the latter in the territory of Central Asia (called Eastern Iran) have many points in common. The brilliant era of Kuṣāṇa Culture is meaningful in the history of fruitful exchange between the peoples of India and Central Asia. During the period of Kuṣāṇas, great centres of Buddhism appeared at Khotan, Kashgor, Tashkent, Bukhara, Balkh and Bamiyan. With the establishment of Arab power in Central Asia, Buddhism and Islamic ideas came into contact and a number of new schools of thought appeared which sought readjustment of ideas to new situations. Many Indian concepts which had influenced the Central Asian mind came back to India under new garbs. In this aspect, the Arab intellectual thoughts also played an important role. Since Central Asia was during mediaeval times. a part of the vast Arab culture area, movements of men and materials could flow easily between India and Central Asia.

The following silk routes and other link roads were well known :

Kashgar-Samarqand-Bukhara

Kashgar-Kuchi-Karashahr-Turfan (via north of Tarim Basin)-Tunhuang

Kashgar-Karashahr-Lou-Lan-Tunhuang

Kashgar-Khotan (via south of Tarim Basin) Niya-Charkliq-Tunhuang

Kashgar and Samarqand were on the junction of the main trade route from India (via Balkh), from Persia (via Merv) and from Turkish dominions. As a result these places became meeting places for exchange of ideas, men, materials and commodities.

But much of the knowledge that reached other peoples and was acquired by them had gone into oblivion. Whatever is left is to be studied and interpreted carefully in order to establish the scientific and cultural tradition of the region, and thereby generate in the peoples now inhabiting the region a sense of awareness. This will also help the understanding of the general incongruencies that were conditioned by the peculiar features of economical, social, cultural and historical development of different peoples. This study, it is felt, will not only refute the idea that historical fortunes are exclusive to some nations but will also establish the significance of international relations and character of scientific and technological progress that are conducive to the generation of scientific knowledge.

Realising the importance of contributions of the region, the UNESCO initiated studies and organized conferences on history, culture, arts and crafts, science and technology of Central Asia in which Afganistan, India, Iran, Mongolia, Pakistan and USSR participated. The international conference on Kuṣāṇa period held in 1968 in Dushanbe brought to light many aspect of cultural interchange between the peoples of these two regions. Following agreement on scientific exchange and scientific co-operation between the Department of Science and Technology, Government of India and USSR Academy of Science on February 18, 1975, Indian National Science Academy (New Delhi) and Institute of History of Science and Technology (Moscow) were asked to chalk out programmes. At later stage Uzbek Academy of Science (Tashkent) and Tajik Academy of Science (Dushanbe) from USSR side also joined the programme. The following areas were broadly agreed upon for work under History of Science.

1. Exchange of scientists in the field of History of Science.
2. Organisation of bilateral seminars at regular intervals and publication of proceedings relating to India and Soviet Central Asia.
3. Translation and publication of materials relating to Soviet Central Asia and India, into English by Indian side and Russian version by Soviet side.
4. Preparation of a list of select Arabic and Persian manuscripts containing useful informations of both countries—their studies and publication.
5. Liberal flow of books, journals, microfilms, manuscripts and other materials.

6. Joint Research programme on editing of monographs, research & survey programmes, and travel accounts.
7. Translation from English to Russian and *vice versa* for selected works. Russian side has already shown interest for printing into Russian the collected papers of History of Sciences in India.
8. Comparative studies of Ulugh Beg's observatory at Samarqand with Jai Singh's observatories at Delhi, Ujjain, Mathura, Benaras and Jaipur.

As a follow up action, the first Indo-Soviet Seminar on Scientific and Technological Exchanges between India and Soviet Central Asia in Mediaeval Period was organised in Bombay on 7-12 November, 1981. The proceedings have been printed by the Indian National Science Academy (New Delhi) in 1985. The idea of joint volumes dealing with contributions from established experts from both the countries were also mooted and the present volumes are the outcome of this collaboration. It has been decided that the English version of the volume will be published by INSA and the Russian version by the USSR Academy of Sciences.

The publication has been planned in two volumes as follows :

Volume I — General Ideas & Methodology, Astronomy, Mathematics and Physical Concepts.

Volume II — Medicine, Technology, Arts & Crafts, Architecture and Music.

Two Editorial Boards were formed for collating and editing the materials which run as follows :

Volume I :

Indian Side : A. K. Bag (Convenor), W. H. Abdi, S. M. R. Ansari, S. K. Mukherjee, S. N. Sen and K. S. Shukla.

Soviet Side : A. I. Volodarsky (Convenor), M. S. Asimov, P. G. Bulgakov, M. M. Khairullayev, B. A. Rosenfeld and S. Kh. Sirazhdinov.

Volume II :

Indian Side : B. V. Subbarayappa (Convenor), M. N. Deshpande, S. P. Gupta, Irfan Habib, O. P. Jaggi and A. Rahman.

Soviet Side : Y. S. Voronkov (Convenor), U. I. Karimov, B. A. Litvinsky, S. R. Mikulinsky, Yu. N. Nuraliev and G. A. Pugachenkova.

The Volume I and II contain contributions from twenty-eight Indian and thirty-seven Russian experts. A few papers published before have also been reprinted which are expected to throw some additional light. The study on the whole has revealed the importance of many Indian and Central Asian manuscripts—their methodology and contents. New insight has been available on various concepts on astronomical parametres, numerals, spherical laws

of sine, knowledge of jyās and al-Khwārizmī's algebra, astrolabe, magic square, indeterminate equation, knowledge of binomial expansion, ethics of medical practitioners and their conduct and attitudes, dietietics, gastroentrology and different diseases as described by Avicenna, metal workings, agricultural practices, textiles, architecture, irrigation techniques and the influence of miniature paintings, music and musical instruments which show that many of them have become the part of both Indian and Central Asian tradition. The study would reveal many a linkages suggesting a synthetic tradition continuously developing and evolving as a result of various interaction. This has provided fresh impetus through social change or cultural development for new ideas and innovation. A glimpse may be found how science was internationalised by al-Khwārizmī, Habas al-Hasib, Farghani, Al-Bīrūnī, Avicenna, Ulugh Beg and other scientists. There existed also two hostile schools on Greek and Indian science and philosophical knowledge in mediaeval east. In spite of this rivalry, the examples from al-Karaji, al-Nasavi, Abu-l-Wafa and al-Khwārizmī and others have proved that the synthesis of creative endeavours of scholars of India and Central Asia made a tremendous impact in the world civilization.

The general editors expressed their sincere thanks to the members of the Editorial Boards in compiling and editing the volumes and correcting the manuscripts, wherever necessary. The editors are also thankful to Dr. R. L. Verma, Dr. Syed Aftab Hussain Rizvi for incorporating diacritical marks of Arabic and Persian words, and Professor S. Maqbul Ahmed of Aligarh Muslim University for a few valuable suggestions. Special thanks are also due to Dr. M. Dhara, Associate Editor (Publication) of the Indian National Science Academy for his general guidance regarding printing, Shri R. N. Ghosh and Shrimati Shabnam Shukla of the History of Science Department of the Academy for rendering all kinds of assistance including sorting out of documents and correcting proofs of manuscripts, and Shri B. N. Chakrabarti for typing necessary documents required for the purpose.

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MEDICINE

DEVELOPMENT OF PHARMACOLOGY AND TOXICOLOGY IN THE MEDICINE OF INDIA AND MIDDLE ASIA (UP TO THE TENTH CENTURY A.D.)

P.P. DENISENKO

The scientific and technological revolution has influenced, directly or indirectly, practically all the fields of human activity, specifically changing each of them, and, as a result, some areas of such activity have obtained a new sense and a special significance. All these changes are clearly observed in the field of medicine, the development of which represents the level of the development of a sense of well-being, its science and art. A triple fusion of science, art and craft, medicine has always tried to develop a ethical human being. In the thermo-nuclear age, these tasks of medicine should receive special attention, because only medicine is able to demonstrate to the mankind all the fatal consequences of nuclear war as well as pollution of the environment. The dual aspects of medicine, viz, the theoretical basis and superstructure have acquired special social significance in our days. To understand the present and to determine the trends of the developmental process, it is indeed necessary to reflect over the history of medicine.

The contemporary medicine has been facing complex problems, and their successful solution is possible on the basis of further development of biological sciences, using physical, chemical, cybernetics, psychological and the Marx-Lenin philosophical data. This is confirmed by history, since the different medical system and doctrines of the past were formulated under the influence of the then dominant philosophical views and theories.

Pharmacology and Toxicology of Ancient India

The materia medica of Hindus is rather comprehensive and includes drugs from all vegetable kingdoms. The most revered is water, especially those of the Ganges river.

Substances of animal origin include: (i) skin, nails and hair for fumigation for curing intermittent fever and others; (ii) blood (for bloodloss); (iii) meat in combination with oils and vegetables for combating malnutrition, consumption and nervous diseases; (iv) bones in the form of ashes in combination with other drugs for curing children nervous diseases, also for fumigation; (v) fats and oils externally for embrocation and also internally (like cow's *ghee* for consumption and fat from human "ambrosium-like" milk); (vi) hair externally for embrocation and internally for combating malnutrition; (vii) gall, as stimulator, was used for treating fever, and also for eye disease; (viii) milk as a main nutritive substance and also in combination with different broths for the nutrition of child and curing nervous diseases,

and in combination with oil externally; of vast implication was milk of cow, goat, camel, sheep, buffalo, mare and elephant and also serum; (ix) urine as mild laxative for diseases caused by mucous and polluted air, for eradicating worms and poisoning, leprosy, dropsy and dyspepsia as well as jaundice (preference was given to cow's urine); (x) excrement, especially cow's, externally for treating inflammation and change of skin colour, and also internally in combination with other drugs; and (xi) honey, eggs, spanish flies and leeches.

Mineral Substances

It would appear that Hindus were the first to use mineral substances and had profound knowledge of chemistry. This class of substances include (i) salts; saltpetre, sodium black salt (sea like stomachicum), borax, ammonium salts, and sulphur; (ii) precious stones, used as nourishing substances (tonics), including diamond of four kinds: white, yellow, red and black, which was used internally in combination with clay or cow's extreta with horse's urine; then pearls, corals and so on in combination with lemon juice; (iii) metals—mercury found as such in Nepal or in the form of cinnabar in Tibet, was purified in different ways (amalgamation with antimony, tin-arsenic, and also by sublimation). Thus black (*Aethipps mineralis*), white yellow and red varieties of mercury were obtained. Mercury was held in high esteem as one of divine substance of great curative value.

It was believed that a "physician acquainted with the curative properties of roots and herbs is human; one acquainted with the properties of knife and fire is a demon (*asur*); one acquainted with the power of prayers is a prophet, while one who is a acquainted with power of mercury is god".

Apart from mercury, gold was considered to be the most powerful nourishing or strengthening substance. Generally it was flattened into thin sheets, incandesced, and then triturated 6-7 times in oil, milk and other fluids, which also served as drugs. In the same way, silver, copper, iron, lead, tin, zink, sulphide of antimony, and arsenic or acidic arsenic were known to Hindus from ancient times and they used them, in proper medicinal formulations and proportions for the cure of skin diseases, leprosy and mania.

Drugs of vegetable kingdom are the most numerous, but no one of them seems to be of European origin. Suśruta has described the properties of 760 drugs of vegetable kingdom. Vegetable drugs were gathered and prepared by physicians themselves, on auspicious days and hours, with prayers. Special attention was paid to the quality of the soil on which the plants grew, which must be neither dry, nor sandy, nor uneven and rocky, nor salty, but soft, succulent and damp of black, yellow or red colour and situated near water and beautiful blossoming trees. Flowers of plants depend on sun and moon rays. The best plants were obtained from the Himalayas. To find good plants it was necessary to travel along the hills and forests, to gather knowledge from herdsman and hunters, more importantly from

Brahmins. The drugs were prepared only by qualified physicians. Drugs prepared by others were considered as useless. They were believed to lose their quality after the touch of a sick person or a menstruating woman.

The rules for drug usage depending on sex, age, the strength of a sick person and also the condition of 'air', gall, mucus 'inner heat' and so on, have been described in detail.

Drug Classification

Suśruta divides the drugs into two major categories. To the first category belong stimulating drugs; here also are included purgatives and emetic substances used for decreasing the stimulating action of rotten juices and for restoring their normal relationships. 39 types of drugs are used for treating 'air' diseases, 23 for mucous disease; and 20 for gall disease. Depending on their action the drugs were subdivided into (i) diaphoretic, these include hot water, poultice, different decoctions and others; (ii) emetic, the best of which was *madana* (*Spermacoce hispida*); (iii) purgatives : roots of *convolvulus turpum*, *cortex* of *Symplocos rasemosa*, *Ricini myrrobalanea* (primarily for children and weak elderly persons in small quantities). Many varieties of the cucurbitaceae were used just like Emetico-cathartica; (iv) Pastes from different purgative substances; (v) Enemas (enemata), especially for diseases of deep abdominal organs and lower extremities, the enema tube being the bladder of healthy pigs and, in special cases, the skin fur with a tube made of gold or silver. Such tools were also used for injections in the bladder; (vi) Sneezing drugs (Errhina) (a) powder-like substance introduced into the nose by a tube; (b) smoke from resin burning (*gummi resina* and so on); (c) pastes from *Piper nigrum et longum agur* (a kind of fragrant tree); (d) smoke from hair feathers and so on to induce vomiting. Sneezing drugs are counter-indicated during hemoptysis, spontaneous outflow of semen, poisoning, wounds, jaundice; (vii) Gargle from different tightening broths, juices from sour fruits (*Piper nigrum et longum*) in combination with oil, vinegar, wine, cow's urine, salt and honey; (viii) Emmenagogue vinegar, cow's urine, curdled milk and wine; (ix) diuretics in the form of broths and powders; (x) Labour stimulating drugs were not well-known to the Hindus and manual methods were used for these purposes; (xi) sialogogics were not used until the age of five, the main among them being mercury subchloride and sublimate, *Piper nigum et longum*, rock-salt, sour fruits and dry ginger; (xii) Stimulants: local in the form of pastes, and general as carminative and different nutritive substances; (xiii) Astringents: generally used for normal diarrhoea as well as bloody diarrhoea, ulcers and hemorrhages. To this class belong the helminthic drugs such as *Biringa Viranga* (*Embelia ribes*); (xiv) Alternate stimulate elimination of ill functions are used for treating the old and adults. They are of three kinds: (a) pleasant: cold water, milk and honey; (b) memory stimulating and life prolonging; sugar, juice of *Hydrocotyle asiatica* etc, to be used for six months continuously together with milk, sugar along with daily hot baths in the evening. The same medicaments are used for

treating leprosy and dropsy (c) youth-preserving drugs: cold water, copper, oil, different substances preventing grey hair and hair-shedding; (d) drugs for satisfying such physiological needs as hunger and thirst; (xv) Nourishing substances (*tonics*) which play a significant part and stimulate memory and prolong life. Holy *soma* was considered to be the most powerful and was used mainly for compositions intended to prolong life. Various types of abhrodisiacs belong to this category. Apart from nutritious food, both vegetarian and non-vegetarian, wine, nuts, company of young women, full-moon nights, beautiful gardens and flowers on the one hand and the powder of *Vidara* (*Flacourtịa catapharcta*), of *amalaka* (*Phyllanthus embilica*) in combination with sugar, honey, milk etc, were recommended on the other. Addition of bitter, salt and sour substances to food, reduces body fluids altogether as well as sexual attraction. (xvi) Oily substances for external applications and internally as purgative ointments and as injections into ears and urinary tract; (xvii) Cooling substances externally and internally in the form of cold tinctures for reduction of life activity; (xviii) Narcotics: *Canabalis indica* (*ḥashīsh*) juice, *datura*, *Aconitum ferix*, *opium* (*alphena*), *Nerium odorum* (*Karavīra root*), *Coculus indicus* (*Karela*) were used. *Strichnos nux vomica* (*kaephaul*). *Dhūmrapatra* of the Hindus may be the same as *Nicotiana tabacum*; (xix) Chemical substances: they include: caustic substances and those dissolving urinary stones and sand.

Drugs were administered internally in the form of powders, fresh juices of plants, extracts, broths, infusions, burnt substances (*bhasmas*), tinctures, pills and electuria, sweets and oils and externally in the form of embrocation, bathing, fumigation, and inhalation. Suśruta states that, in the hands of an ignorant physician, the drug is a poison, while in the hands of an experienced, it is like the "immortal drink".

Toxicology

According to Āyurveda, a physician should have deep knowledge of poisons and their antidotes, "as the enemies of the king, malicious women and ungrateful servants might poison food sometimes". The book, *Mitākṣarā* gives detailed instructions as to how the poisons could be recognised, as also the persons who indulge in such wilful acts. All poisons were considered to possess the following properties:

(i) blackening and rigidity of the tongue, fainting, difficult breathing; (ii) shivering, sweating, fever, pain in the stomach; (iii) pain in the stomach, swelling and yellowishness of eyes, stomach-ache, hiccup, vomiting, rumbling in the bowels; (iv) headache; (v) salivation, change of skin colour, ache in joints and stomach; (vi) loss of sensitivity and diarrhea; (vii) rigidity and death. As antidotes were used at first cold water, second-emetics in combination with vegetable broth, honey, oil and then purgative; third-sneezing substances, collyria, oil, honey, liquorice broth and astringent substances for dysentery; at all stages—anti-inflammatory substances, cold water and different vegetable broths.

Suśruta recognized 30 kinds of poisonous snakes, the acidic and burning poison being in their teeth and which are subdivided into five classes, depending on the fact whether their poison attacks fatty tissue, intestines, or organs, bones, brain and semen (poisoning of the latter is fatal). The treatment of poisonous bites consists of immediate ligation (binding) of part of the body above wound with a band of cloth, skin, plant cortex etc. If this is impossible, the bitten place would be obstructed either by incision, followed by washing and purification of the wound or by application of dry *cupping* (horns) and further in candescence by fire. Suśruta mentions also suction, and between the lips and wound, a piece of bladder being tied. Music and different prayers are also recommended. But the physician must not rely only on prayers; he must use antidotes. As reliable antidotes *agada* against animal poisons (snakes), Suśruta mentions *tṛivrit* (*Convolulus* turpenth) *bihalā* (*aconitum ferox*), *madaka* (*Bissica latifolia*), *haridrā* (*Curcuma longa*), *dāruharidrā* (c. *Berberis Asiaticu*) *rakta* (Nymphoea odorata), *arjuna* (*terminalia*).

Suśruta also mentions a kind of "*antiditum universale*", from asafoetida, *Citrus decumanus* and so on, in combination with salts, pepper, ginger, used against vegetable, animal and mineral poisons. He gives rather a true picture of animal poisoning. Description of hydrophobia as a result of bites by rabid dogs as well as jackals, foxes, wolves, bears, tigers, in no respect differs from the picture of fear, described in any modern manuals. The treatment of hydrophobia includes scarification of the bitten place, squeezing of blood followed by washing and burning by heated liquid oil. Then the wound is dressed using a mixture of different antidotes, *Calotropis gigantia* and the like administered internally. During treatment, the patient must be kept in a cool place without any moisture, and the treatment terminates in baths. The same data Suśruta gives about the bites of insects (spiders, scorpions), frogs and lizards.

The use of poisons as drugs is of special interest. These include *datūra Aconitum* (*amṛta*), opium (*Aiphena*), *Nerium indicum* (*Karabira*), *Calotropis gigantea* (*arka*), *Gloriosa superba* (*lāngllia*), to be boiled with milk or water infusion of cow excreta, which served as narcotica and stimulantia. Seeds of *crotonis,* prepared in the same way were given in small doses at the onset of fever, as well as *Euphorbium Uleandrum Hellaeborus* and different kinds of acotine. The dried gall of fish, goats, buffaloes, wild bears, peacocks was considered to be a stimulant. *Nux vomica* was administered internally, and externally for leprosy; bitumen externally for rheumatic fever, falling sickness, hysteria and paralysis. Poisons were applied internally in the following order: first day—a dose in a size of mustard grain, adding daily the same quantity for 7 days, reducing such quantity in the following 7 days; the third week the dose equalled barley grain, then daily adding the same quantity, in the 4th week reducing this quantity. Generally, these drugs were given with milk. Counter indications were hot temperament and gall disease. These drugs were forbidden for eunuchs and those with haemoptysis, good appetite, thirst, tiredness, royal household, interperate mood among patients and other persons. Mineral

poisons like corrosive sublimate, orpiment and copper sulphate were used in small quantities in solutions during different diseases. Weak poisons included; *Asclepias gigantea, Euphorbia* etc. In general, administration of poisons to persons under ten and over 80 years was forbidden, and the use of drugs had to exclude all fears in relation to the patient.

Pharmacology and Toxicology in Persian-Tadjik Medicine

Observing the three main periods of medical development in Iranian speaking nations (Kushitic—800-200 B.C.: Parthian-Samanid (second century B.C. to seventh century A.D.); Samanid period—nineth-tenth century A.D. it can be seen that by the tenth century A.D. several views in different fields of medicine were stabilised including those of pharmacology. These are known in medical history under the general term "The Epoch of Ibn Sinā or Avicenna".

This seems quite logical, since all the works of predecessors and contemporaries of Avicenna (Muhammad bin Zakaryāl Rāzī; Abū Mansur Hasan Nāh Kal Qumrī, Abū Rīhān al-Bīrūnī, Aba Mansūr Muqar fazal Horawi, Ali ibn Abbās al-Majūsl, Abū Sahl al-Masīhī, Abūl Hasan-bin Rabban, al-Tabari and others have shown that Avicenna critically used, generalized and developed all the previous observations.

In the times of Avicenna, all knowledge on pharmacology and curative properties of substance were based on clinical observations, i.e, the main feature of pharmacology of the age of Avicenna was an empirical use of compounds and an accumulation of vast knowledge on clinical pharmacology. Knowledge on curative properties of the drugs increased greatly as a result of the consolidation and rapproachment of ancient Greek medicine, Persian-Tadjik and Indo-China medicine. Such a approachment resulted in the widespread use of the most effective drugs, although simultaneously it was the cause of discrepant and even false opinions about curative properties of the same preparations.

It was necessary to systematize different groups of drugs, establish inter-connections and especially to evolve the problems of general pharmacology. Having realized the importance of this problem; Ibn-Sina paid great attention to general and particular pharmacology of the then existing drugs. This is confirmed by chapters and even sub-chapters dealing with particular or general pharmacology of drugs in each of his medical books.

Avicenna developed general principles for the treatment of patients and described them in the first book of *Qānūn* under the heading "on General Means of Treatment." According to him, treatments are done in three ways: "...one of them is regimen and nutrition; the second, application of drugs; and the third, mannual treatment," i.e., surgery. Treatment with drugs must take into account the

(i) The drug must be free from physico-chemical influence and other factors as well as changing its activity;

(ii) the disease for which the drug is tested must be simple, i e , without complications; and

(iii) the drug should be tested for two opposite diseases, since sometimes it cures one disease directly (direct action) and the other, indirectly. Avicenna believes that negative effect of the drug can be revealed only at patient's bedside, by continuous observation on its action. Avicenna's thesis that "tested drug is better than non-tested" is of primary concern even in our days when profit-motivated chemists indulge in spurious practices.

In the second book of *Qānūn*, the drugs are presented in alphabetic order. Each drug is characterized not only by its pharmacological but also by its pharmacognostic properties. Doses, scheme of treatment, indications and contra-indications are described here.

Now in the USSR alone, more than 70 drugs described in *Qānūn* are widely used. Most of them are included in the last edition of Pharmacopeia of the USSR (GFH, 1968). To the so-called "Qanun-pharmacopeic" drugs, 45 plant substances are attributed such as anise, henbane, oak, calamus, marshmallow, hawthorn, absinthum., aloe, artemesia, juniper berries, soporific poppy, ricinus, lin-seed, water capsicum, almond, apricot, mint oil, liquorice valerian, rhubyab black mustard, peach oil etc. From these modern medicine receives tanins of simple galenic and reogalenic compounds and also individual active substances like alkaloids.

The fourth book of *Qānūn* deals with questions of particular toxicology, pharmaco-therapy with mineral (mercury, arsenic, lead oxide, vitriol, alum etc.), vegetable (oleander, elowfoot, opium, stramonium, henbane, mushrooms, Armenian shafts etc), and poisnous insects (spiders, *Sathrodectus taedicim guttatus*, *tarantula*, scorpions, wasps and bees) as well as the toxicity of snake poison.

Here Avicenna speaks as an experienced toxicologist, describing in every detail the toxic properties of poison. For the first aid and drug therapy for those who are bitten, he recommends such drugs, as would act as pharmacological or chemico-physical antagonists of poisons. Avicenna's general principles of treatment of poisoning are quite in accordance with modern requirements.

The fourth book contains also pharmacological characteristic of cosmetics.

The fifth book deals entirely with Compound drugs and their preparation, and serves as pharmacopeia for the *Qānūn*. There are only two chapters in this book. The first chapter "On Complex Drugs included in Pharmacopeia", is one of the biggest chapters and consists of 12 independent heads, characterizing the composition and preparation of 508 complex drugs which were used, up to the

tenth century.

The second chapter of the fifth book of the "*Qānūn*" entitled "Test of Drug for such Separate Disease" consists of 18 heads and represents a reference book on "Symptoms and their Treatment", wherein preparations, and indications for 186 complex drugs are described. Avicenna investigated principles of combination of different substances included in the complex drugs.

Description of complex drugs are given, starting with the most complex ones, consisting of approximately 70 components (like *tarjaka* and *chyma*) and then follow more simple drugs along with the methods of their preparation. Most of the drugs are generally named after the physicians who prepared them (hippocrates, Galen, Brutanis, Mahur Erasistratus Phyloxen etc.).

Among the available monographs, devoted to drugs, such books as the *Alwohiya* and *Al-adviya* and *al*-Qalbiva are important.

The *Alwohiya*, unlike other books by Avicenna, does not deal with the theory of medicine, diagnosis and prognosis of different diseases. Only in the Introduction, the author briefly describes how to use the book.

On the whole, the book comprises 149 chapters, each of which is devoted to particular groups of diseases, demanding the same treatment. It is in the first book that the substances which stimulate memory and mental activity are described (psycho-stimulators in modern terminology). Besides, one chapter is devoted to drugs which eliminate depression (i.e. antidepressants), as well as those for meningitis, paresis, paralysis, hyperkinesis, cramps, schizophrenia and other diseases.

Then follow the drugs for treatment of inflammation of eyes, night blindness, eliminating leucoma, stimulating eyelash growth.

As to the drugs used for curing ear inflammation, more than ten vegetable oils or mixtures of juices of vegetable (lemon and garlic juice) and animal origin are recommended together with vegetable oils like oil from hennand weeds, juice from the leaves of walnut, dried water-melon cortex in combination with honey, and also gall in combination with honey, and other remedies.

Effective drugs for treating nose bleeding, cough, vomiting, liver diseases, rejuvenation, female diseases, and above all, heart diseases, have been described in detail.

Thus "*Alwohiya*" is a kind of practical guidance, convenient for use. In emergency and difficult cases, a physician acquainted with symptoms or diagnosis of the disease, can easily find the necessary drugs in the corresponding parts of the book to treat a particular disease.

The encyclopedic *Qānūn* of Avicenna, his treatise "On Heart Drugs", the book entitled "Code of Recipes" and his other works contain valuable knowledge on problems of general and particular pharmacology, pharmacognosy and also the methods of preparation of more than 2000 simple and complex drugs.

A study and scientific analysis of these drugs from the point of view of modern pharmacology can provide a rare insight into the secrets of ancient eastern medicine, which would be an invaluable service to mankind.

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DOCTOR'S ETHICS IN ANCIENT EAST WRITTEN CLASSICS AND IN THE WORKS OF MIDDLE AGE MEDICAL SCIENTISTS

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Ethical education of a doctor as well as his conduct in the society and especially the personality of a doctor himself are rather interesting aspects of the history of ancient medicine. These aspects have been dealt with elaborately in the ancient Indian manuscripts on the Ayurveda like the *Suśruta Saṃhitā* and in the old Persian book, the *Âvesta* (6th-8th B.C.).

These ancient texts, which are monuments of human culture, present laws and rules regulating doctor's activity including such questions as his personal character, physical development, emotional state and even his physical appearance and the doctor's fee as well.

In ancient times, the physicians were regarded as priests, the high-ranking persons of the society, both in India and in Iran and Middle Asia. Therefore, they were surrounded with a shining halo of glory and honour and they enjoyed special privileges and welfare intended for the higher castes of the then society.

In India, the doctors not unoften belonged to the higher caste—the *brāhmins*. According to the Ayurveda, a doctor could come from the three generations of *brāhmins*, from the two generations of *Kṣatriya* or of *Vaiśya*.

In ancient times, medicine was one of the most noble arts in the East. Thus the demands made on the doctors were rather strict and severe. The doctor in all his totality, both in internal and external qualities, had to possess high and noble professional expertise. Education was indispensable and had to be imparted to the talented pupils. Therefore, the selection of these who would be future doctors was very strict in ancient India. The Āyurveda enjoins that such persons should have excellent qualities, distinguished abilities, and they should be truthful, reasonable, unselfish, modest and industrious.

One who wishes to be doctor should be a "staid man of noble origin, who is not engaged in any ordinary trade, who has normal eyes, mouth, nose and spine, who has thin red and clear tongue, even teeth and normal lips, who is not snaffling and has strong character, who is unselfish, clever who has a good reason and memory, who is talented in general and from a doctor's family or at least associated with doctors, who addresses to truth, who has all limbs and all senses, who is simple in his dressings, modest, clean, low-tempered, decent, pious, clever and adroit, studious and eager to acquire both theoretical and practical knowledge, who is ungreedy and not lazy, who wishes happiness to all human-beings, who follows all demands of his

teacher and devoted to him, is fit for this purpose. Those possessing these qualities are called pupils".

The experienced doctors chose pupils as future doctors, in accordance with these demands.

The Ayurveda and the *Suśruta Samhitā* paid great attention to the internal character and the external built of a pupil along with his family background.[1]

The pupils were admitted ceremoniously according to the well established rules and regulations. These were compulsory and had to be followed by everyone. Those who wanted to become pupils would go to his chosen teacher during winter term on a full-moon day in a happy frame of mind. The pupil had to wash and fast, comb his hair, put on red clothes and bring fuel, resin, vessels filled with water, gold, silver, precious stones, pearls, corals, linen, kinza-grass (Pod. cynosuroides), rice grain, mustard, bundle of white flowers, sacrificial food etc. The invitation ceremony usually performed in the presence of *brāhmins* and doctors in the evening when there were stars and the moon in the sky, would begin with a sacrifice to gods. It included rice, flowers and precious stones, and offering presents to *brāhmins* and doctors. After the sacrifice, the teacher would lead the initiated thrice round the sacrifice fire and, summoning the sacrificial fire to be his witness, he would address the pupils in a following way: "Now you forget all passions, anger, selfishness, madness, vanity, pride and envy, rudeness, trickery falseness, laziness and depravity of any kind. From this time on, you will have your hair and nails shortly cut, wear red clothes, live a pious life, avoid voluptiousness and obey your teacher. You must stay, walk, sit or lie, eat and study when I order you to do it, and you must always be ready to promote my well-being. If you disobey, you will make a sin and all your studies will be useless and worthless. And in case I behave improper in your respect while you fulfil your duty, then I draw sin upon myself and all my knowledge would be fruitless."

Finally, the teacher would give a number of useful advices to the future doctors so that he treated *brāhmins* free of charge and supplied them with drugs. He would also treat his teachers, poor people, his friends neighbours, ministers of religion and also orphans and strangers, but not hunters, bird-snarers, villains and criminals. "Those who observe these rules become famous and acquire friends, glory, virtue, wealth and all other desirable things".

Caraka gives valuable admonitions concerning the relationship between the doctor and a patient and speaks about iatrogenic action of a carelessly said word as well as the secrecy of doctor's conclusions: "With all his soul he (the doctor) must be concerned with the treatment of his patient and he has no right to make the patient suffer, he must not even dream to offend the wife of the other person, as well as tread his property under foot even if he were to risk his own life. He must

be simple in his clothes and in his appearance; he must not be a drunkard, and must keep away from evil company. His speech must be pleasant, clear, truthful and considered. He has to take into account the place and time, make exercises in meditation and constantly try to find a support for his knowledge and enlarge them... When a doctor followed by an acquaintance, who has the right to enter, enters the dwelling of a sick person, he must be well dressed, and with his head down, he must be meditating and have firm bearing and he must observe all possible respect. All his words, thoughts and senses must be directed only to the treatment of the patient and on matters concerning his condition. It is strictly forbidden to speak about house affairs, possible death of a patient in case it can harm the latter or somebody else.

The medical teachers who were from the upper castes could select their pupils. As to the teacher himself, he had to possess certain moral qualities, deep and profound knowledge in medicine both in its theoretical and practical aspects. He should possess the ability to choose from a great number of manuals the most suitable one and explain the most complicated questions. One teacher was allowed to teach not more than 3-4 pupils simultaneously. The tuition would generally begin at mid-day and finish towards the evening.[2]

Caraka lays emphasis on the fact that a doctor must never boast of his knowledge. Many patients refuse to go to a talented doctor if he likes to boast. Medicine is easy to study. So let everyone study it thoroughly and constantly.

Even in the ancient times, Indian doctors deeply appreciated mutual discussions and exchange of ideas among themselves. They regarded such discussions to be an exchange of experience and one of the ways of obtaining additional knowledge. Caraka says: "discussions with your colleagues enlarges your knowledge, gives pleasure, develops your abilities, teaches you dialectics and gives you respect."[3]

Special attention has been paid by Caraka to the health of a doctor, his appearance, personality, character, intonation of his voice, and his attitude towards the patient. "The doctor desirous of being successful in his work, must be healthy, tidy, modest, patient, must have a short beard, clean and shortly cut nails; he must wear white perfumed dress, and he must leave the house with a stick in his hands or an umbrella and avoid talks and jokes with women. He should not sit with women on the same platform. His speech must be calm, pleasant and encouraging. He must have a compassionate heart, strong truthful character and low temperament. He must be noted for great temperance and chastity. He must constantly do good to everybody. You may be afraid of your mother, father, friends and teacher, but you must not fear a doctor. The latter, therefore, must be more kind and attentive to his patient than the father, mother, friends and teacher. On the other hand, a good doctor must dilingently visit and carefully examine his patient. He must not be afraid or irresolute."[4]

The doctor had to possess a thorough knowledge of different fields of medicine and especially of surgery: "The doctor unskilled in surgery is embarrassed at patient's bed, like a coward soldier taking part in a battle for the first time in his life. The doctor, skillful only in surgery and ignoring theoretical knowledge, deserves no respect and can endanger even the life of a king. A doctor acquainted only with a half of the art, will resemble a bird with one wing only."

It is well known that the outcome of the treatment depends not only upon the skill and experience of the doctor to make a precise diagnosis but also upon his ability to prescribe a proper drug taking into account its curative and side effects. Lack of knowledge of toxic properties of the drug may result in harmful outcome. According to the admonitions given in the *Suśruta*, "the drug in the unskillful hands is a poison and by its action it can be compared with the action of a knife, fire or light; on the other hand, in the skillful hands, it is like a drink of immortality."[5]

Thus the ethical norms developed by the ancient Indian medical men were generally of high humane character. They embraced all aspects of the doctor's activity, beginning from the years of his education and ultimately becoming an experienced doctor. The ethics of ancient Indian doctors had two distinct parts: (i) the ethical norms and requirements for the pupils, i.e., future doctors; and (ii) those concerning the doctor's behaviour in society, his relationship with the patient and his relatives. This can be confirmed by an Indian saying: "The doctor is the father for his patient; he is a friend for a healthy person; when the disease is conquered and the health is restablished, he can be regarded as a guardsman."[6]

Avesta, the sacred book of Zoroastrism (8-6th century B.C.), belongs to the ancient literary legacy of Iranian people. In different parts of this great work and especially in *Vendidād*[7], the text is completely devoted to medicine and discusses the problems of doctor's ethics and his position in the society. An analysis of these data shows that our ancestors required the doctor to follow a number of certain rules which were strict for that time. First of all, each doctor, like any other follower of a certain religion, had to behave himself according to ethical demands and the main rules given in "*Tāta*", the most essential points of which were that man must have good thoughts, speak good words, and do good acts: "We glorify all good thoughts, all good words exist now or will exist in future, and we preserve purity of all good that exists" (*Gāta*, "*Yasna*", Chapter VII, XXXV). The doctor had to satisfy the following requirements: i) He had to treat all types of patients including his enemies and heretics of zoroastrism; (ii) any doctor, surgeons included, might treat patients only after suecessful treatment of the three sick heretics, i.e., non-fire-worshippers; and (iii) he should test the drugs and prescribe them to simple people or those condemned to death, and only afterwards could they be prescribed to high ranking persons.

In the primitive society, the medicine of priests was not given on a large scale, it was intended for chiefs of the tribes, military and town nobility and for the members of their families. So it is not surprising that all the other cases could not get the medical aid of high ranking and priest doctors.

The doctors received their fee due to certain tariff. As there was no mementary transaction the payment was made in kind. After the decay of the primitive society and its stratification in terms of the rich and the poor, the payment for medical treatment depended mainly upon the social status of a patient: the priest paid in the form of a pious blessing; the house owner presented the doctor with inexpensive she-camel, his wife presented him with she-ass and, for the treatment of their son, the doctor was paid with she-camel by the house owner and with a cow by his wife; the chief of the town-guard paid the doctor with a chariot of four horses and his wife paid him with she-camel. (*Vendidad,* Chapter VII).

Judged by "*Vendidād*", there were as yet no veterinaries in Middle Asia and Iran at that time. So the doctor had to treat the animals as well. The payment was as follows: ". . . . For the treatment of the most expensive she-camel the doctor was presented with a she-camel of a medium cost, and for the treatment of the medium cost she-camel he was presented with an inexpensive she-camel; for the treatment of the latter he received sheep and goats, and for the treatment of sheep and goats he got meat for a meal". As to the payment for treating the other castes, the book does not say anything, probably because that, at that stage of development and in the face of the emergence of a class society, patients from poor families or from the lower castes used, as a rule, the achievements of folk medicine. It is worth mentioning that all moral and ethical norms in the "*Avesta*" were determined by the respectable priests.

In Iran and in Middle Asia, the norms of doctor's ethics like all the other aspects of medicine, extended far beyond the boundaries of religion during the Sassanid region. The doctor was required to have a deep knowledge of theoretical and practical medicine. He had to be kind and humane towards his patients. He had to treat all the patients, administering proper care. He was not permitted to wear too guady clothes, be too rich and have much fortune. The *Dan Karda* lists the following rules which were obligatory for all the doctors: "When asked for help or treatment, the doctor must thoroughly examine the patient according to the methods that are at doctor's disposal and then undertake a proper treatment. His (doctor's) well-being must equal those of a common village, community or province dweller. He must have a delicate, curative hand, he must care for his patients and never punish them. A good doctor is one, who fulfils his duties, perfectly knows the constitution of human body, who is well acquainted with surgical methods, who has deep knowledge of drugs and herb, and who reads much". The doctor must receive his patients joyfully with a smile on his lips, he must be kind and patient

with them. In case of necessity he must come to their bed in any time of day and night. A good doctor is a man who does not seek prosperity but try to treat patients for piety, performing his duty for people. A bad doctor is a man who treats patients for fee. "The doctor had also to treat war-prisoners and respect them like his other patients."

As it can be judged from the many cited ones from *Dinkara*, the doctor's ethical norms have a high humane nature. But if we take into consideration the severity of the slave-owing system where a man (a slave) could be bought and sold and where the ruthless exploitation of man prospered and where such state of events was legitimate it is difficult to imagine that there was a doctor who practiced according to the above mentioned ethical norms.

A great contribution to the history of medicine and to the history of doctor's ethics was made by the Middle Age Persian and Tadjic medical scientists Mohammed Zakāria al-Rāzī (925), Ali ibn Abbās Ahvāsi (died in 994), Abū Álī ibn Sīna (980-1037) and some others. All their works were deeply concerned with the questions of doctor's ethics. Al-Razī stated: "A man devoting himself to medicine must be well educated, modest, truthful and humane. Besides he must be wise and in each case he must look for the heart of the matter".[8]

Al-Rāzī paid special attention to the study of the achievements of the ancient doctors. He was sure that "the doctor must be acquainted with the achievements of his ancestors, he must properly analyse the books he reads and use the acquired knowledge when necessary". He wrote that "thousands of doctors had probably tried for thousands of years to improve medicine. Therefore, those who read their books attentively trying to grasp the main things, learn much more than if they have been visiting the hospitals for thousands of years. . . . Since it is impossible for a man, whether he lives as long a period as this, to understand the major part of medical science if he is not acquainted with the works of his ancestors . . . The doctor is educated not only by books but by the ability to discuss the things he read and to use them in practice when it is necessary".

'Ālī ibn 'Abbās Ahvāzī devoted his treatise *Pandnomai Pizishki* the "*Mannual for Physicians*" to the problems of doctor's ethics. "The respect you pay to your father and mother, who gave you birth, you must transfer to your teachers".

Treating patients, the doctor must be very attentive and try to use not only drugs but also rational nutrition to cure the patient. The treatment is performed as a virtuous deed and by no means it must be a source of enrichment. The doctor must not prescribe dangerous drugs to his patients and these drugs must not also be advertized among the patients. He must prescribe drugs producing toxical effects as rare as possible.

The doctor must keep the secrets of his patients. Many patients conceal their diseases from their parents, relatives and friends, but they should not conceal them from their doctor. Hence it is the moral duty to the doctor to take care of his patients' secrets. In all cases, the doctor must follow the directives of Hippocrates. While treating the patients, especially the poor ones, a doctor must not even think of and trouble them about the fee. He must be polite, benevolent and try to help the poor to buy drugs even on his own account. And when it is essential he must be at patient's bed day and night, specially when treating the heart diseases, because, patients with heart troubles are highly emotional.

The doctor is not permitted to spend his life in entertainments and amusements. He must not drink alcoholic beverages, as alcohol effects sensory organs and weakens memory. His only duty is to enlarge his knowledge, to read books on theoretical and practical medicine not only to understand and memorize them but to use the acquired knowledge in practice.

The process of medical education had to be finished at an young age, as the material is better memorized and interpreted in this period of life that in old age, which turns out to be the mother of forgetfullness. A young practitioner must learn in a hospital at patient's bed under the guidance of experienced doctors.

'Alī Ahvāzī concludes his admonitions as follows: "Only in such case he (the doctor) may easily communicate with his patients, and his patients will look at him with confidence and come to him timely. And only the doctor of such type will always be respected by his people".[9]

A great contribution to ethical education of future doctors was made by Abū Álī ibn Sīnā. Being a teacher and an experienced humanist, he wrote with great love about doctors who served medicine truthfully and wholeheartedly and treated their patients devotedly despite the difficulties they constantly confronted within their noble trade.

The problems of education and doctor's ethics take an important part in all of his works dealing with medicine, ethics, literature, poetry and with philosophical problems of biology as well.

Urḍjūza (on admonitions for doctors), "Urdijuza (on Hippocrates Admonitions) and the treatise *"The Doctor"*, written by Ibn Sīnā are devoted to ethical education of doctors and their behaviour in the society. Speaking about the significance of words uttered by a doctor, he compares the later with a poet. Thus he wrote: "Poets are lords of the word; doctors are angels of health. The former fill the soul with joy, the latter cure the body with their devotion and kindness."

According to this outstanding thinker, the doctor must not only care for his patients' health, but also for the health of the healthy persons. He stressed: "Be

enterprising of a healthy man's health, so that he would be healthy for a long time."[10]

The patient must rely on a doctor and the latter, in turn, must keep his patients secrets. The relationship of a patient and his doctor depends greatly on these aspects. Therefore, Ibn Sīnā addressed his pupils with the following words: "Keep the secret from those who inquire and be careful; the wisdom is something different than caution. Your secret is your slave, if you can keep it; and you become the slave of your secret if the secret is disclosed."

In some cases, a word said by a doctor becomes a strong curable agent, in others, thorough examination and necessary advices can be of great help (iatrogenic action). For example, in his book *Urdjzūa vi-t-tibb* (A Poem on Medicine) he wrote: "Emotional stress elevates the body temperature and sometimes causes serious disturbances of a body. "The sick man is always easy to offend and is very capricious. Thus Ibn Sīnā was rather strict himself and towards his pupils while examining patients. He emphasised that "the doctor must have a vision of a falcon, the hands of a mind (tenderness of mother's hands), wisdom of a snake (caution) and heart of a lion (courage)."

These words underlie the importance given by Abū Ālī Ibn Sīnā to the personal qualities of a doctor. In all his works, he made a great professional and moral demands on the doctors.

Thus the precepts of the medical works of the ancient East and the codes of the Middle Age scientists on the duties and ethical behaviour of doctors in the society, his relation with patients overlived centuries; their ideals were passed on from generation to generation and they served the basis for the moral education of many future generations of doctors, thus elevating the medical professions highly moral and humane character. All these are not only significant but also relevant to the complex process of medical education and practice of a modern doctor.

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EXCHANGES BETWEEN INDIA AND CENTRAL ASIA IN THE FIELD OF MEDICINE 'SPECIALLY DURING THE MUGHAL PERIOD'

HAKIM ABDUL HAMEED

There had been a great intermingling among nations particularly those located in the same geographical regions and areas since time immemorial. India's contact with Central Asia dates back to remote past and covers many fields-social, political, intellectual and economic. Caravans of men and streams of thought constantly moved and flew between India and Central Asia, resulting in intimate cultural relations between these two regions. The history of such contacts falls into four distinct phases : (i) from the 7th Century to 1220 i.e. from the Arab conquest of Central Asia to the overthrow of Central Asian states particulaly Bukhāra by Chingez Khān in 1220; (ii) from 1220 to 1370 i.e. from Chingez Khān's conquest of Central Asia to the rise of Tīmūr; (iii), from 1370 to 1526 i.e. from the rise of Tīmūr to the edvent of Bābur in India, (iv) from the beginning of the 16th century to the middle of the 17th century, being the era of the Great Mughals in India, the Safavids in Persia and the Uzbeks in Central Asia.[1]

When the Ábbāsid Caliphs evinced interest in Indian sciences and invited Indian scholars to work in the bureau of translation, a new source of transmission of Indian ideals to Central Asia came into prominence. Ibn Nadīm has given a long list of Indian works which were translated into Arabic at the instance of the Barmecides. Evidently these Indian works must have reached the Central Asian Scholars.

In 770 A.D. *Brāhamsphuṭa-Sidhhānta* of Brahmagupta was translated into Arabic as *Al-Sind Hind.*[2] Similarly other Sanskrit works on astronomy like *Āryabhaṭiya* and *Ārya Siddhānta* (of Āryabhaṭa, 499 A.D.) were rendered into Arabic as *Arkand* or *Zīj-i Arjabhar.* Through these works of the Sidhhantic astronomy reached Central Asia and many Indian astronomical mathematical concepts found currency there. An example of the latter is *Al-Khwārizmi's* (c. 835 A.D.) book on Indian arithmetic or methods of calculation.[3]

Indian medical ideas, herbs and methods of treatment were also transmitted from Baghdād to distant parts of the Caliphate. Manka who had cured Caliph Hārūn ul-Rashīd, was appointed as an incharge of a bureau of translation for rendering Sanskrit works on medicine into Arabic. The earliest works on medicine by Caraka and Suśruta are frequently referred to by Rāzī (Rhazes) and Ibn Sīnā (Avicenna) in their works.[4] In the 14th century, we find II-Khanī envoys inculding men like Rashīd-ue-Dīn Faḍlullah[5] visiting India in search of Indian herbs and medicines. It is quite significant that the earliest work of Indian medi-

cine, the Bower manuscript was found in Chinese Turkistān in 1890.[6]

In the field of religion, the impact of Indian thought was more significant. The *Mutazalite* treatises of the 8th century A.D., contain accounts of Indian monks and hermits. The extent of Central Asian knowledge about Indian religions can be gauged from the section on India given by Shahristānī (1076-1153) in his *Kitāb al-milal wa al-nihāl*. Of course, the philosophic enquires of Al-Bīrūnī about Indian thought were unprecedented in depth and dimension.[7]

In the Medieval Period, however, the current of transmission reversed. The four great Books on Traditions on which the Muslim religious sciences are based, came from Central Asia: The *ṣahīh* of Imām Muhammad bin Ismā'īl Bukhārī (870), *Kashshāf* of Abū Qāsim Maḥmūd Bin 'Umar al-Zamakhsharī (1144), the Usūl of Ālī b. Muḥammad Bazdavī (1089) and the Hidāya of Alī bin Abū Bakr Marghinavī. Throughout the medieval period these books were prescribed in the syllabus of Indian madrasas and formed basis of intellectual activity as the Indian *Ulamā'* wrote commentaries, annotations summaries on these works.[8] Isami[9] is confirmed by Diyā-ul-dīn Baanī who says that there were scholars in Delhi whose equal could not be found in *Bukhārā*, Samarqand, Baghdād, Khwārazm or any other part of the contemporary Muslim World. He refers to the visit of the Central Asian scholars[10] to India in order to learn at the feet of Indian *Ulamā*. Amīr Khusrow Dehlavī had declared about Delhi at that time: *Zi Īlm-i bā Āmal Delhī Bukhārā*.[11]

Devotion to the Ṣūfī and his mystic cult formed an important feature of life during the medieval period. Many towns of this region-Aush, Jam, Suhraward (Suharward), Gīlān, Yasi, Bukhāra, Samarqand etc. were cradles of mystic orders and many important saints who planted these *silsilahs* in India came from Afghānistān, Central Asia or Persia. It is however a noteworthy fact that the development of these mystic orders was greater in India than in the lands of their birth. It is interesting to note that Tashkent libraries abound in large number of Indian manuscripts of mystic works of the 16th and 17th centuries.[12]

There was frequent movement of men between India and Central Asia. Tribal pressures, love of learning, mystic wanderers, prospects of employment and unsettled conditions were some of the determining factors. During 11th and 13th centuries, the *Ghuzz* and *Mongol* invasions threw a large number of people into India. When Chingez Khān tore the social and political fabric of Central Asia, to pieces and raxed all its buildings, mosques, madrasahs etc, to ground, large number of men belonging to different walks of life came to India to hide their heads under safer places. They not only supplied personnel to the nascent Delhi Sultanate but also planted the traditions of Muslim scholarship in India. Many distinguished families which played a vital role in the cultural history of India during medieval period came from Central Asian towns of Bukhārī, Samarqand,

Nakhshab, Nuhmera etc. Balban settled the Central Asian princes, nobles and scholars in different localities and named those *muhallāhs* after their homes as *Muhallah-i Khwārazmshāhi, Muhallah-i Atābakī, Muhallah-i Samarqandi, Muhallah-i Khitai.*[13] Balban also instituted an enquiry into the geneologies of many families which had settled in India. For instance, the ancestors of Shaykh Nizām-ue-dīn Awliyā' of Delhi, Sayyid Jalāl-ue-dīn of Uch, Shaykh Ábdúl Haq, Muhaddith of Delhi came frem Bukhāra.

During the reign of Sultān Sikandar of Kashmīr (1389-1413), many Central Asian scholars like Sayyid Muhammad, Sayyid Jalāl-ue-dīn, Bābā Hājī Adham came to Kashmīr and settled down there.[14]

The Mughal Period

However, the greatest and the most significant contacts which India had with Central Asia were from the beginning of 16th century to the middle of 17th century which, as mentioned before, was the era of the great *Mughals* in India, the *Safavids* in Persia and the *Uzbaks*—in Central Asia. The Mughal emperors always cherished the desire to possess their homeland of Irans-Uxiana, and thus there had been maximum number of changes among these regions during their reign. They were so keenly interested in recovering those wonderfully beautiful regions that Bābur sacrificed even his religious principles.[15] Humāyūm, though he had attempted to regain them during his father's life time, had other misfortunes to fight with. Akbar was prevented by the great power of Ábdullāh Khān, Jahāngīr was too lazy to leave the charms of Kashmīr and Lāhore. Shāhjahān had a disastrous campaign against the advice of his ministers Sád Allāh Khān and Álī Mardān. Aurangzēb had taken a lesson as commander-in-chief of his father's forces and thus had an Indian policy instead of Central Asian Policy.[16]

In the court of Akbar, we find people belonging to Central Asia working in different capacities. Among the nobles of Akbar, Qulī Khān, a *mansabdār* (Officer) of six thousand *dhat* (infantry men) and five thousand *Sawār* (cavalry men), was from Andijan. Amongst his distinguished poets Abūl Fadl mentions the name of Mushfigī of Bukhārī, who had once been the poet Laureate of Ábdullāh Khān[17] and Khwāja Hasan of Merv[18] who received a reward of two lac *takās* for his excellent poems on the birth of Salîm and Murād. Qādī Abūl alī Má distinguished jurist who came from Bukhārā and men like Naqīb Khān learnt "at his feet".[19] Akbar, who was very fond of pigeons, employed Central Asian men like Qulī Alī and Ábdúl Latif of Bukhārā, Maqsūd and Mastī of Samarqand[20] to look after his pigeons, as Central Asia had a reputation for the finest breeds of pigeons.

Diplomatic embassies were exchanged between India and Tūrān from time to time for conclusion of alliances, collection of information and other political purposes. During the reign of Emperor Akbar, the ruler of Tūrān, Ábdullāh

Khān Uzbek sent two embassies in 1572 and 1577[21] and one return embassy was sent by Akbar. Again, in 1586 A.D. Ábdullah Khān sent an envoy to Akbar's court with offers of alliance against Persia and Akbar sent Ḥakīm Humām to monitor the thinking in Tūrān. Ultimately a treaty was concluded which was broken time and again.

Besides political exchanges, the Indian courts attracted a large number of men of letters and medicine from other countries. Here, we would confine ourselves to the physicians who came from the countries of Central Asia to the *durbārs* of India from time to time.

Emperor Babur

Hakīm Amīr Abū'l Baqā' (d. 1541).

One of the early physicians who came to the court of Bābur (reigned 1526-30) the founder of the Mughal Empire in India, was Hakīm Amīr Abūl Baqā. He was a close confident of the Emperor, well versed in both medicine and philosophy and was also famous for his depth of knowledge.[22] He also lived in the reign of Emperor Humāyūn for a long time. Humāyūn held him in high esteem. He died in an accident in 948 A.H. (1541 A.D.).[23]

Ḥakīm Baqā is known to be the author of a Persian Commentary on Mīr Sayyid Sharif.[24]

Hakīm Yūsuf bin Muḥammad bin Yūsuf al-Herāvī

Ḥakīm Yūṣuf b. Muḥamad b. Yūṣuf Al-Herāvī was the son of Hakīm Muḥammad b. Yūsuf, a famous physician of Herat. He came to India with the retinue of the Mughal Emperor Bābar in 1526 A.D. and was appointed as the personal physician of the emperor. He also lived during the reign of Emperor Humāyūn and served as Emperor's secretary.[25] He was also a good poet.

Yūsuf b. Muḥammad Herāvī is the author of the following medical works, mostly in verse.[25]

1. *Usūl al-Usūl* (beginning of 16th/century A.D.)
2. *Dalāl al-Baul* (1536 A.D.)
3. *Dalāl al-Nabd* (1538 A.D.)
4. *Favāid al-Akhyār* (1507-A.D.)
5. *'Ilajal-Amrāḍ* (Beginning of 16th century A.D.)
6. *Jāmi 'al-Favāi'd* (1508 A.D.)
7. *Qaṣiadah dar Ḥifẓ-i Sihḥat* (1531 A.D.)
8. *Risālah Mākūl-O-Mashrūb* (1557-8 A.D.)

9. *Riyaḍ al-Ādvīya* (1540 A.D.)
10. *Sittah-i Ḍarūrīya* (1538 A.D.)
11. *Amrāḍ-i- Chashm* (1535 A.D.)

Yūṣuf b. Muhammad is also the author of a non-medical work known as *Badī' ul-Inshā'* on rhetoric and composition.[27]

Emperor Akbar

Hakīm Shams ul-Dīn Gīlānī (d. 1581)

The Ḥakīm came from Gīlān to India during the reign of Emperor Akbar. Besides being an expert physician, he had unique knowledge of philosophy, logic and other secular sciences of his time. He was also well-versed in theology and jurisprudence.[28] Mullā Ábdúl Qādir Badāyūnī has called him the "Christ and Galen" of his time.[29]

Due to his deep scholarship and extra-ordinary skill, he soon became a good companion of Emperor Akbar who bestowed on him the title of '*Hakim ul-Mulk*'.

He was the student of Sheīkh Muḥammad Shāh Abadī. He was a practical scholar known for his exemplary behaviour with people. He was himself an affectionate teacher and used to pass most of his time in the campany of students; even he used to take his meals with them.[30]

He was deeply religious and did not like the way Emperor Akbar used to hold religious disputations. In his opinion, it was a clear disregard of principles of Islam and Islamic law. He tried to express his dissatisfaction by preaching, advice and discussion, and finally by leaving for Hejāz in 1580/81 where he died in 1581.[31]

Hakīm ul-Mulk's son Abúl Qāsim came also to India and was one of the distinguished physicians in the court of Emperor Jahāngīr and Emperor Shāhjahān and also held the title of '*Hakīm ul-Mulk*.[32] His grandson Mīr Muḥammad Hāshim also came to India from Gīlān during the reign of Emperor Aurangzeb and served as personal physician of the Emperor.[33] His second grandson, Mīr Muhammad ja'far also came to India in the days of Emperor Muḥammad Shāh. He was court physician of the Mahārāja of Jaīpur.[34]

Ḥakīm Amīr Faiḥullāh Shīrāzī (d. 1589)

Ḥakīm Amīr Fathullāh Shīrāzī was the son of Shukrullāhshīrzī.[35] He was born and brought up in his native town Shīrāz. He studied medicine and other sciences with Khwāja Jamāl-ul-dīn Manṣūr Shīrāzī.[36] Shāh Nawān has also mentioned Maulānā Kamāl ul-dīn Shīrwānī and Maulānā Kurd as his teachers.[37]

After completing his education, he worked at the schools of his teachers for some time.

By that time, his reputation had crossed the frontiers of Iran. Áli 'Ādil Shāh, the ruler of Bījāpur invited him to India. On arrival in Deccan, he was received with great respect and honour by the said ruler who made him his special companion. Ālī 'Ādil Shāh was murdered in 988 A.H. (1581 A.D.) and his successor Ibrāhīm 'Ādil Shāh was a luxurious king fond of music and dance. Hakīm Fathullāh Shīrāzī did not like his un-Islamic ways and began to think about leaving the court. When Akbar came to know about the intention of the Hakim, he immediately wrote letters to Ibrāhīm 'Ādil Shāh and Rāja Áli Khān, ruler of India to send the Hakim to his court. Finally, Hakim, Amīr Fathullāh Shīrāzī left Deccan in 991 A.H. (1583 A.D.) and reached Fatahpūr in the month on Rabī' al-Awwal the same year. He was received by *Khān-i Khānān* and Hakīm Abūl Fath. Emperor Akbar showered great honour and respect on the Hakīm who soon became a close companion of the Emperor. In 993 A.H. (1585 A.D.) he was given the exalted office of *Ṣadārat*[38], he married the daughter of Muzaffar Khān Tarbīyatī.[39]

On account of his wisdom, sagacity and insight, the Emperor bestowed on him the titles of *Amin-ul-Mulk 'Adud ul-Daulah* and *'Adud ul-Mulk* one after another. He was also included in the Council of Minister and Raja Todar Mal was ordered to consult him in all financial and state matters.[40]

As mentioned before, Hakīm Amīr Fathullāh Shīrāzī was a man of extra-ordinary intelligence with full knowledge of various sciences. According to Shāh Nawāz Khān; "he had no 'second' in Īrān and India, rather in the world."[41] And Shaykh Abūl Faḍl writes about him: "If all the medical works of older scholars are destroyed, he has the power and abilty to compile them again"[42]

Hakīm Amīr Fathullāh Shīrāzi had invented a windmill which used to run a gun, firing 12 rounds. He also invented a mirror which used to show strange faces even at a distance.[43]

Amīr Fathullāh Shīrāzī had written many books. Some of his works are given below:—

(i) *Risāla-i Ája'bāt-i Kashmīr* (Treatise on Wonders of Kashmir): It has been incorporated in *Akbar Nāma* by the order of the Emperor.

(ii) *Khulāṣat al-minhāj*: It is a commentary of *Qurān*, in Persian, which was quite famous.

(iii) *Minhāj al-sādiqīn*: A detailed commentary of *Qurān*, not extant in India.

(iv) *Tārīkh-i ālfī*: He was the co-author of this book. Events of the second year of Akbar were mainly written by him.

(v) *Tārikh-i jadid*: This is a part of *Tārīkh-i-ilahi-Ākbar Shāhī* which was completed under his guidance.

Ḥakīm Amīr Fatḥullāh Shīrāzī died in 997 A.H. (1589 A.D.) while he was returning from Kashmir. Emperor Akbar was much grieved on this news and remarked: "Amīr Fatḥullāh was my advocate, counsellor, physician and my astronomer. No one can gauge our sorrow. Had he been arrested by foreigners and had they asked all my treasure for his release, I would have considered it as a profitable transaction."[44]

He was buried at the monastry of Mīr Sayyed Ālī-Hamadānī, later his dead body was shifted to *Kuh-i Sulaymān* by the order of the Emperor.

Hakīm Masīh ul-dīn Abūl Fatḥ Gīlānī (d. 1589)

Among the famous early physicians who came to the court of Emperor Akbar and gained popularity in the court, was Ḥakīm Masīh ul-dīn alias Abūl Fatḥ. He was the son of *Ābdúl Razzāq*, the famous physician of Gīlān, who was a close associate of the ruler of that territory. When Shāh Ṭahmāsp Safavī (?) invaded and annexed Gīlān in 974 A.H./1567 A.D., he imprisoned *Ābdúl Razzāq* who died in prison.[45] It was one of the famous *shiite* families of Gīlān in Iran.[46] *Hakīm Abū'l Fatḥ* was the eldest of the four sons of *Ābdúl Razzāq*. His other brothers were *Hakīm Najūb ul-dīn Humāyūn*. *Hakīm Nūr ul-dīn Qarārī* and *Hakīm Luṭfullāh Gīlanī*, all expert in the field of medicine.

Ḥakīm Abūl Fatḥ studied various branches of learning from his father and acquired in-depth knowledge in sciences of his time. He was a good poet and writer[47] but medicine was his speciality. His extra-ordinary knowledge of medicine can be judged from his book *Fattāḥī*, a commentary on *Chaghmanī's Qānūncha*, which shows his high intellectual calibre and expertise.

Hakīm Abūl Fatḥ was a man of kind nature known for generosity and sympathy to his fellow men.[48] It is alleged that he was immoral and atheist.[49] This is incorrect, according to Āzād who vouchsafed for his deep religiosity.[50]

Abūl Fatḥ left his native place, Gīlān, along with his brothers Humām and Qarārī and came to India during the reign of Emperor Akbar (reigned 1556-1605). They were received with great honour and were given high positions in the court. Gradually, the hakim rose to the position of a courtier having 800 horsemen in his command and to the office of *Ṣadr-ul-Sadūr* of Akbar and wielded great influence with the Emperor. His status in the *Darbār* can be judged from the remark of *Maulānā Ābdúl Bāqī Nahāwandī*[51] according to whom: "He enjoyed more influence with Emperor *Akbar* than *Ja'far* influence with Emperor *Akbar* and

Jafar Barmecide had with Caliph *Hārūn ul-Rashīd*".

Abul Fath Gilāni was well versed both in medicine and theology. Following works of the Ḥakīm are known to us to-date :

(i) *Fattāhī*: it is a detailed commentary on *Qānūncha*,[52] of *Chaghmani*, pp. ca. 3C0,

(ii) Commentary of *Al-Qānūn* of Ibn Sīnā in Persian[53]

(iii) *Qayāsīya*: A commentary on *Akhiāq-i-Naṣari*, 1400 pp.

(iv) *Chār Bāgh*: It is a collection of personal letters by the Hakim to his family and friends like Fayḍl, Abū'l Faḍl, *Khān-i-Khānān*, Humāyūn etc. These letters are a fine example of simple and unadorned language similar to that of Abūl Faḍl. Their literary value is not less than that of the writings of Abūl Faḍl.[54]

Abūl Fatḥ Gīlānī died of diarrhoea at Damtur[55] on his way from Kashmīr to Kābul were he was assigned by Emperor Akbar to proceed for a campaign. He was buried at *Hasan Abdāl*[56] near Peshāwar (now in Pākistān) by the order of the Emperor. The burial was arranged by Khwāja Shams ul-Dīn Khawāfī. Later, a dome was built on his tomb.

Ḥakīm Áīn-ul-Mulk Shīrāzi (d. 1595 A.D.)

The Ḥakīm was an Irānian physician who was married to Fayḍi's sister. From mother's side, his lineage reached the famous Ḥakīm Dawa".

He was a distinguished physician, surgeon and *Oculist*.[57] He was also a good poet and a good-natured, witty and courageous person. He was a man of both peace and war.

Ḥakīm Shīrīzī began his career in the court of Emperor Akbar and accompanied the emperor on various expeditions. Akbar was convinced about his medicial expertise when he was accidentally injured by arrow shot by Qatláq Khān. He was operated and treated by Ḥakīm 'Ayn ul-Mulk and the wound was cured in a week time.[58]

He also showed his valour in battles and statesmanship at various errands entrusted to him. In 1565 A.D. (9th year of Akbar's accession to the throne) he delivered a *Farmān* from Emperor Akbar to Chingez Khān who was an influential man in Aḥmadābād. In 1573 A.D. he went to Itimād Khān Gujrātī and delivered to him the message of condolences from the Emperor. In 1575 A.D., he accompanied the Emperor on his visit to the eastern provinces of the empire. Thereafter, he was sent to Deccan to guide 'Ādil Khān of Bījāpur. On his return, he was appointed as the commander of the Army of Sanbhal in 1578 (the 22nd year of

Akbar's accession to the throne). Four years, later, 'Ayn ul-Mulk Shīrāzī was sent to Sanbhal to suppress the rebelion of Nayābat Khān which he did successfully. The same year he was appointed to the high office of *Ṣadārat* (governership) of Bengal. In 1587 A.D., he was made district Officer in the province of Agra.

Hakīm 'Ayn ul-Mulk Shrīāzī died at *Ḥandia* in the month of *Zúl Hijja*, 1003 A.H. (1595 A.D.).

Hakīm Najīb ul-dīn Humām (d. 1596 A.D.)

He was the younger brother of Ḥakīm Abūl Fatḥ Gīlānī, as mentioned before. In the beginning, he was known by his real name Humāyūn or Humayun Qulī but later on he changed his name to Humām as a mark of respect to Emperor Akbar whose father was Humāyūn.

Hakīm Humām was held in high esteem by Emperor Akbar who in one of his letters, called him "the source of learning and wisdom" and" a man of extra-ordinary personality among his (Akbar's) friends".[59] His position and status can also be judged by the fact that in 1588 A. D. he was sent as the envoy of Emperor Akbar on return embassy with valuable presents to the court of 'Abdullah Khān Uzbeg, ruler of Tūrān. Further, Hakīm Humām, in his letter of credential, was introduced as"a truthful and sincere confident of amiable nature and good disposition who has never been kept away from us since our coronation and who has the permission to talk to us without any intermediary"[60]. In fact, Hakīm Humām was very dear to Akbar. When he had gone on an expedition, the Emperor used to say that "his food had lost its savour ever since Hakīm Humām had gone away". Likewise, once addressing Hakīm Abúl Fatḥ, the Emperor said : "do not think that Humām is your brother and that is why you are to be more perturbed than ourself. One can not find a second Humām.' [61]

Hakīm Humām was also held in high esteem by Emperor Jahāngīr. Once Jahāngīr got seriously ill due to his alcoholic addiction and the long treatment by the three famous court physicians Ḥakīm Ruḥullāh, Ḥakīm Ruknā and Hakīm Ṣadrā did not bear any fruits. So Hakīm Humām was called to attend on the Emperor. According to Jahāngīr : "I called Hakīm Humām, the brother of Hakīm Abúl Fatḥ who was the special advisor and *confidant* of my respected father and told him my condition. He gave me his advice without any fear and hesitation which was the outcome of his utmost sincereity and affection to me and began the treatment. On his advice, I began mixing *Philonium Romanian* in my drinks and gradually increased its quantity, reducing the quantity of wine to the same degree and thus I was cured of my alcoholic addiction by his treatment.[62]

Hakīm Humām died of tuberculosis after an illness of two months. He was buried by the side of the grave of his brother, Ḥakīm Abúl Fatḥ at Ḥasan Abdāl.[63]

None of the works of Hakīm Humām are known to be extant to-date.

Hakīm Nūr ul-dīn Qarārī (d. 1596)

He was the youngest brother of Hakīm Abúl Fatḥ Gīlānī. He came to India with his brothers in 982 A. H. (1574 A. D.) and entered the court of Emperor Akbar through the influence and recommendation of his brother. He was not only an expert physician but also an exquisite poet. He used to compose excellent verses in Persian[64] under the pen-name of Qarārī. Some of his sayings have become proverbial,[65] e. g. "Expression of motivation before other physicians is an expression of greed."

"Why should I blame or accuse death while I am struck by the arrow of your modesty which shall kill me even if I die a hundred year hence."

It has been reported that Qarārī led a simple and care free life without worrying about this world and the world after-death.[66]

He had gone to Bengal by the orders of Emperor Akbar, where he died on 6th *Rabī al-Awwal* 1004 A. H./1596 A. D.

Ḥakīm Luṭfullāh

Hakīm Luṭfullāh was the younger brother of Ḥakīm Abūl Fatḥ Gīlānī. He left his native place Gīlān in Irān, after his three brothers had already arrived in India where he joined them. He entered the court of Emperor Akbar on the recommendation of his brother Abūl Faṭh.

Ḥakīm Luṭfullāh was an expert physician with a very good knowledge of his subject.[67]

Hakīm Alī Gīlānī (d. 1610)

He was the nephew (sister's son) of Hakīm Ul-Mulk Shams ul-dīn Gīlānī and a close relation of Amīr Fatḥullāh Shīrazī.[68] He was born and brought up in Gīlān (Irān). He was well-versed in all the arts and sciences of his time and had an in-depth knowledge of medicine and mathematics.[69] He had learnt medicine from Fatḥullāh Shīrāzī and secular sciences from Sheikh Abdúl Nabī.[70]

Ḥakīm 'Ali Gīlānī came to India in pecuniary circumstances. He joined the court of Akbar[71] where he secured great honour and respect. Nobles and courtiers also held him in high esteem. He rose to the rank of *Haft Ṣadī* (Officer having 700 horsemen under his command). He also held the office of *Sadārat* of the province of Bihār.[72] During the time of Jahāngīr, he had the rank of *Do-Hazārī* (2000 horsemen under his command), he was given the title of 'Galen of the time'.[73] In 1580 A. D. he was received with great pomp and honour.[74]

The Hakīm was undoubtedly a skillful medical practitioner. He was the

personal physician of the royal family. Emperor Akbar was convinced of his intelligence, practical knowledge, and particularly of his power of diagnosis. He had successfully treated patients who had lost hope of their life. Jahāngīr called him "an incomparable physician who had full knowledge of Arabian sciences".[75]

For instance, when Emperor Akbar got sick in his old age, he called Hakīm Alī Gīlānī for treatment. Earlier in 1004 A. H. (1596 A. D.), when Akbar's poet laureat, Fayḍī was down with the dangerous diseases of asthama, dropsy and hematemeris and his condition deteriorated at mid-night, the Emperor chose him from many other famous court physicians to attend on Fayḍī.

Hakīm Álī Gīlānī was also a mathematician of high calibre. In 1594, he built a remarkable tank (20′ × 20′ × 9′) in Lahore.[76]

Ḥakīm Álī Gīlānī is the author of the famous commentary of Canon written in five volumes and in Arabic : *Sharḥ-i Gīlạni*. This commentary is considered to be one of the most authentic source of Unani medical literature. It has not been found till to-date but it has been referred to in many medical dictionaries. Jahāgīr has also mentioned this work in his *Tuzuk*. According to Ábdūl Qādir Badāyūnī, it was this book which led Hakīm Abūl Fatḥ Gīlānī to write his commentary on *Al-Qānūn* (Canon) of Ibn Sīnā.[77]

Hakīm Alī Gīlānī has many new prescriptions to his credit. The most famous one is the use of *Juniper* (*Cedrus Deodara* or Himalayan Cedar) oil for pain in muscles and joints as well as treatment of nerves with singular results. This oil is being used by *Ūnānī* physicians even today.

Ḥakīm Áli Gīlānī died on 5th of *Muḥarram*, 1018 A. H. (ca. 1610 A. D.).

Hakīm Alī Gīlānī had only one son, named Hakīm Ábdul Wahhab but many pupils. Mīr Hāshim and Ḥakīm Sadrā were his famous students. The latter Hakim was bestowed with the title of *Masīḥ ul-Zamān*.

Hakīm Faghfūr Lāhījāni (d. 1619-1621)

The Hakīm belonged to Lāhījān in Gīlān. He studied medicine with the husband of his aunt (mother's sister), Ḥakīm Tāj ul-Dīn who was the companion and physician of Sulṭān Murād Khān the ruler of Māẓandarān. Faghfūr acquired perfection and expertise in medicine under the guidance of this relative and also gained full knowledge of Arabian sciences.

Besides, being an expert physician, he was a distinguished poet known for eloquence, new ideas and diction. Great poets of the time like Shafāi Iṣfahānī acknowledged his excellence as a poet.

This poet-physician came to India in 1012 A. H. (1604 A. D.) and entered the court of ʿAbdur Rahīm *Khān-i Khānān* who was famous for his generosity and

patronage of men of letters and sciences. *Khān-i Khānān* gave ample recognition of his talents. Faghfūr has written many poems (panegirics) in praise of his patron.[78]

In 1028 A. H. (1619 A. D.) he joined the court of Parvez, son of Emperor Jahāngīr, at the instance of *Khān-i Khānān*[79] and died a year later. However, there is disagreement among writers about the year of his death. According to the author of *Riyad ul-Shuárā*, he died in 1030 A. H. (1621 A. D.),[80] while the year of his death given in *Sarv-i-Azād* and *Meykhāne* is 1028 A. H. (1619 A. D.) and 1029 A. H. (1620 A. D.) respectively.[81]

Hakīm Muẓaffar B. Muḥammad Al-Husaynī Al-Shifāī (d. 1628 A. D.)

The Hakim came to India from Iṣfahān.[82] Mullā Ábdúl Bagī Nahāvandī has given his name as Sharf ul-Dīn Husayni[83] while Sheikh Farīd Bhkkārī has called him Hakīm Shifáī only.

Besides being an expert physician, he was well-versed in other sciences and humanities of his time. He was also a good poet and expert in sohygmology.

He is the author of the famous pharmacopea, *Qarābādin-i-shifāi*.[84] He also had a number of *mathnawīs* and a *dīwān* to his credit.

Ḥakīm Shifáī died in the month of *Ramaḍān*, 1037 A. H. (1628 A. D.).[85]

Ḥakīm Ḥādhiq (d. 1658 A. D.)

He was the elder son of Ḥakīm Humām. He was born at Fateḥpur Sīkrī during the days of Emperor Akbar.[86] His real name was Kamāl ul-dīn and Ḥādhīq was his *nom de plume*. He was better known for his poetry and prose-writing than as a physician which was his ancestral profession.[87] Still most courtiers used to come to him for treatment because of the reputation of his fore-fathers. He was also well-versed in logic and philosophy.[88]

Ḥakīm Ḥādhiq attained great fame due to his intelligence, sagacity and truthfulness. According to Shāh Nawāz Khān, the Hakīm was a proud, self-conceited and hot tempered man.[89] This should be attributed to his self-satisfaction and sensitivity as a poet.[90]

As mentioned before, Hakīm Hādhiq was a great poet and prose writer. He wrote both prose and poetry in a simple and fluent style which was a deviation from the traditional Indian school of literature. One of his famous verses is being given in English translation :

(O' Hadhiq : nothing satisfies my heart. I have witnessed the spring and flowers as well as autumn).

Shāhjahān (reigned 1627-58) ascended the throne of India in 1627 A. D. He promoted Hakīm Hādhiq to a high rank : 1503 infantry men and 600 horsemen under his command. The same year, he was sent to Turān as the ambassador of Emperor Shāhjahān. In his letter of credentials, he has been introduced as a respectable confidant and a truthful and honest person.[91] On his return from Turān, he was appointed to the high office of the Spokesman of the Court, a position which was given to highly eloquent, sweet tongued persons who know the temperament of the Emperor. Thereafter he continued to rise until he became an officer of the rank : having 3000 horsemen under his command (*Manṣab-i-Seh Hazāri*). Then he retired at a pension of Rs. 20,000 per year which, in view of his importance even after retirement, was raised to Rs. 30,000 in 1054 A. H. (1644 A. D.) and Rs. 40,000 in the 18th year of Shāhjahān's accession.[92]

There is some disagreement about the year of his death which occurred in 1068 A. H. (1658 A. D.)[93] while Blochmann[94] and Ábdúl Haī[95] have given it as 1067 A. H. (1657 A. D.).

Hakīm Muḥammad Amīn Gīlānī

He was the native of Lāhījān, a district of Gīlān in Irān. He went to Tabrīz in search of learning where he studied medicine with the famous Hakīm Jabrā́īl and Hakīm Muhammad Bāqir. He practiced medicine in Tabrīz for some time. According to a report his clinic attracted so many patients that other clinics of the city remained almost empty. Even the ruler of Tabrīz had developed strong faith in the skill and expertise of Hakīm Amīn.

Hakīm Amīn was fond of travelling. Once he went on a journey to *Rūm* (South Europe). On his return he found that Tabrīz was annexed by Shāh Ábbās Safavī· The Hakim went to the court to pay homage and respects and there after went to Gīlān to meet his relations. He did not return to Tabriz, instead left for India where he entered the court of Ábd-ul-Raḥmīm *Khān-i-Khānān* which was known as *Maktab-i-Hoshmandān* (school of intellegentia).[96]

It is said that Hakīm Áli Gīlāni, the famous physician of the court of Akbar, tried to stop him at Delhi when Hakīm Amīn reached there but he did not agree and proceeded to the above court where he was treated with great hospitality and was given a suitable position.[97] Due to his extra-ordinary intelligence and sagacity and wonderful skill, he soon became a close associate and confidant of the *Khān-i-Khānān*.

None of his books and prescriptions are extant up to date. The date of his death is also unknown.

Hakīm Muḥammad Nafīs Gīlāni

He was a native of Lāhijan in the Gīlān province of Irān. He went of

Meshhad in his early age and studied medicine there. After completion of his studies, he came to India and entered the service of the famous Physician-courtier Hakīm Abūl Fatḥ Gīlānī and began to work in his clinic with full devotion and attention. The Hakīm was so pleased with his diligence and quest for knowledge that he entrusted the entire work of the clinic to him. Hakīm Muhammad Nafīs gained full expertise in medicine under the guidance of this patron Hakim. After the death of Hakīm Abūl Fatḥ, he went to the court of Ábdul-Rahīm *Khān-i Khānān.*[98]

Khān-i-Khānān was so much impressed by the knowledge and expertise of Hakîm Nafīs that he appointed him as his personal physician as well as the Superintendent of the Kitchen.[99] He lived in the court of *Khān-i-Khānān* for more than 25 years.

There is no record of the year of his death.

Hakīm Zanbīl

Hakīm Zanbīl was the uncle of Hakīm Sadrā. He arrived in India from Shīraz during the days of Emperor Akbar and ministership of Becam Khān, Khān-i Khānān and the position of Naw-Ṣadī (900 horsemen under his command) was bestowed on him.[100] Khwājak Niẓām ul-dīn Ahmad has called him a close companion of Emperor Akbar.[101] His nearness to the Emperor is clearly shown by the fact that in 1560 A. D, Akbar left Delhi on the pretext of hunting and spent the night at the residence of Hakīm Zanbīl after crossing the river Jamuna.

The year of the death of Hakīm Zanbīl is not given in any reference.

Hakîm Hassan Gīlānī

Hakīm Hassan Gīlānī was one of the most expert physicians in the days of Akbar. His academic stature was not much great but he was a man of sound of conduct and appreciable human qualities.[102]

Hakîm Dawāī

Hakīm Dawā'ī was one of the 29 prominent physicians who decorated the court of Emperor Akbar.[103] He was also the teacher of Shahjahān.[104]

Before coming to India, he had gone to Mecca to perform Haj pilgrimage, After the pilgrimage, he stayed there for a long time. During his sojourn in Hejaz, he developed friendly relations with Mirzā Ázīz who succeeded in persuading him to come to India. He is said to have attained a great fame.[105]

Hakîm Nizām ul-dīn Ahmad Gīlānī

He was also a physician who came to India during the reign of Emperor Akbar. Details about his life and works are not available in any historical reference.

Hakīm Muḥammad Bāqar

Besides Gīlān and Shīrāz, Tabrīz (Āzarbāijān) was a great centre of medicine in Iran, Hakīm Muhammad Bāqar was born and brought up in this city. His brother, Mīr Bāqir Tabrīzī was a very famous and distinguished physician who was the personal physician of the Iranian monarch Shāh 'Abbās Ṣafavī.[106]

Hakīm Muhammad Bāqar came from the same family and like his brother, he was well versed in medicine and other sciences and humanities of his time. He was a distinguished and famous physician of Tabrīz.[107]

Hakim Muhammad Bāqar came to India during the days of Emperor Akbar and entered the court of 'Abd-a-l-Rahīm *Khān-i-Khānān* whose fame as a great patron of men of letters and sciences had reached Iran long ago. *Khān-i Khānān* showed great honour and respect to the Hakīm and made him his companion and personal physician. Hakim Bāqar lived there till the end of his life and amassed lot of wealth.

Hakīm Jabrāil (d. 1616)

Hakīm Jabrāil was the son of Hakīm Muhammad Bāqir. He studied sciences with the famous Mīr Muhammad Bāqir Damād in Qazwīn and Iṣfaāan and gained great skill in medicine.[108] Hakīm Jabrāil was known for his good nature and generosity.[109]

After the completion of his education, he began teaching in *Dār ul-Irshād* by the orders of the Shāh of Irān. After some time, he came to India and entered the court of Abd al-Rahīm *Khān-i Khānān.* He did not stay long in this court and and went to Deccan where he was well patronised by Muḥammad Queī Qutb Shāh, the ruler of Golcunda where he lived upto 1025 A. H. (1616 A. D.).

Emperor Jahangir

Hakīm Mūmenā Shīrāzī (fl. c. 1643)

Hakīm Mumenā Shīrāzī was one of the most famous court physicians of Emperor Jahāngīr and Emperor Shāhjahān. On his arrival in India, he had entered the court of Army Commander Mahābat Khān and came to the imperial court in the last days of Emperor Jahāngīr in the year 1031 A. H. (1622 A. D.). He successfully treated Jahāngīr when the Emperor was suffering from breathlessness and was given valuable gifts as token of appreciation. In 1042 A. H. (1633 A. D.) the Emperor gave him the rank of *Hazārī* (Officer having one thousand horsemen under his command.[110]

Hakīm Mumenā was held in high esteem by Emperor Shahjahān also who continued to show special favours to the Hakīm. In 1042 A. H, (1633 A. D) Shāhjahān sanctioned an annual grant of Rs. 16,000 for him[111] which was raised to to Rs. 20,000 and Rs. 30,000 in 1047 A. H. (1638 A. D.)[112] and 1052 A.H. (1643

A D.)[113] respectively. He treated successfully many members of the royal family during the reign of Shāhjahān also.

Hakīm (Mrs.) Satī ul-Nisā' (d. 1646 A. D.)

Strangely enough, we come across a lady physician also in the court of the Mughal Emperor Shāhjahān. Her name was Satī ul-Nisā. She was the native of Āmul, a city in the province of Māzandarān of Iran. She was the sister of Ṭālib Āmuli, the poet laureate of the court and sister-in-law of Hakīm Rukna. She had extra ordinary affection for her brother and had come to India to see him.

Satī ul-Nisā was an intelligent lady well-versed in household affairs and skillful in medicine. She entered the court after the death of her husband and served as one of the personal attendants (maid) to the queen. Due to her ability, mannerism and conduct, she was soon promoted to the office of "Seal-Keeper" (Secretary). As she was also well-versed in Persian prose and poetry and the art of recitation, she was also entrusted with the teaching of Princess Jahān Āra, the beloved daughter of Emperor Shāhjahān.

Satī ul-Nisā' soon attracted the attention of Queen Mumtāz Maḥal and gained extra-ordinary influence in the palace due to her able management. After the death of Queen Mumtāz Maḥal, the Emperor appointed her as *Ṣadr-i Kul* (Chief Superintendent) of the royal apartments. Her duties included from organization of Emperor's meals to nurshing of princes and princesses. According to Muḥammad Ṣāleh Kanbūh, she knew medical problems very well and was proficient in treating complicated diseases.[114]

Death of her brother Ṭālib Āmulī and sudden death of her niece broke her heart and made her lonely and sad. She died of that shock on 27th of Zill Hijja, 1056 A.H. (1646 A.D). Her body remained buried in Lahore for one year and then it was shifted to a mausoleum built by the Emperor at a place to the west of Tāj Maḥal. He also endowed the place with an income of Rs, 3000 for the maintenance of the tomb.[115]

Hakīm Ṣadrā (d. 1651 A.D.)

Hakīm Ṣadrā was the native of Shīrāz. He was the son of the famous Physician Hakīm Fakhr ul-Dīn Shīrāzī who lived in the days of Shāh Tahmāsp.

Hakīm Ṣadrā studied medicine with Hakīm Muḥammad Bāqir, son of Hakīm *Amhād* ul-dīn Maḥmūd, in Irān and with the leading physician Hakīm Ālī Gīlānī on his arrival in India. He had acquired great expertise in this field.[116] He was also a good poet and composed verses under the *nom de plume* of *Masīḥ Ilahī*.

He belonged to the Shiite sect of Islam and followed his religion meticulously.

Ḥakīm Ṣadrā arrived in India in 1011 A.H. (1603 A.D.) or 46th year of the accession of Emperor Akbar but he achieved fame during the reign of Emperor Jahāngīr who bestowed on him the title of *Masih* ul-*Zamān* and gave him the rank of an officer having 500 infantry men and 30 horsemen (*Panchṣadī dhat wa si sawār*).[117] He continued to receive royal favours during the reign of Emperor S̲h̲āhjahān who appointed him as the spokesman of his Court In the 4th year of the accession of S̲h̲āhjahān, he left for the piligrimage of Mecca and Madīna. On his return from the piligrimage in 1044 A.H. (1635 A.D.) he resigned from his service in the Court and settled down in Lahore. However, he did not severe his connection with the Court and attended on the Emperor whenever called for treatment. In the 18th year of the accesion of S̲h̲āhjahān, he treated the queen for severe burns.

Ḥakīm Ṣadrā died in Kas̲h̲mīr in 1061 A.H. (1651 A.D.).[118]

Ḥakīm Ruknā (d. 1656)

The Hakīm was a native of Kās̲h̲ān in Irān. He arrived in India in the reign of Emperor Akbar but lived in the reign of Jahāngīr and S̲h̲āhjahān. He was an expert physician and an excellent poet. Number of verses composed by him exceed 100,000.[119] Once he evoked anger of Emperor Jahāngīr and remained in disfavour for some time. When the King's anger subsided, he was re-instated to his former position in 1030 A.H. (1621 A.D.). When Emperor Jahāngīr was in Kas̲h̲mīr and he developed breathlessness, he called Ḥakīm Ruknā from Āgra for treatment.[120]

Hakim Ruknā also attaineded fame and popularity durıng the reign of Shāhjahān where he lived upto 1041 A.H. (1632 A.D.). In that year he sought the permission of the Emperor to visit the shrine of Imām Radā in Mas̲h̲hed which was immediately granted. S̲h̲āhjahān gave him robe of honour and Rs. 5000 before his departure [121]

From Mas̲h̲hed, Hakīm Ruknā went to his native place, Kās̲h̲ān, where he died in 1066 A.H. (1656 A.D.).

Hakīm Rūḥullāh

Hakīm Rūhullāh was a resident of Bharoch in Gujrāt. He was an expert physician and an excellent writer. First he was associated with the court of ·Abdul-Rahīm *K̲h̲ān-i-K̲h̲anān* and then he entered the court of Emperor Jahāngir.[122]

Hakīm Fatḥullāh Gīlānī

He was the son of Hakīm Lutfullāh Gīlānī. He followed the profession of his forefathers and acquired full expertise in the field of medicine. Besides, he had a good knowledge of astronomy also. He arrived in India during the reign of Emperor Akbar and also attended on Jahāngīr in his court. He weielded a great

influence in the court, was considered a prominent courtier and physician, and rose to the high position of a courtier and holding the rank of *Hazārī* (1000 horsemen under his command).[123] In his last days, he returned to his country where he is said to have committed suicide.[124]

Hakīm Fatḥullāh Gīlānī was an outstanding physician, He translated into Persian the *Al-Qānūn* (cannon) of Ibn Sīnā.[125] The Persian translation was published by Nawal Kishore Press, Lucknow (India). Only one copy is available.[126]

Emperor Shāhjahān

Hakīm Nizām ul-dīn Aḥmad Gīlānī (d. 1649 A.D.)

The Hakim was born in Gīlān (Iran) in 1586 A.D.[127] He was the son of ʻAbdullāh Al-Sadīdi Al- Shīrāzī. He studied medicine and other sciences with Mīr Muhammad Bāqir Dāmād and the famous theologian Sheikh Bahā' ul-dīn Muhammad Āmulī.

He served the ruler of Gīlān for some time and then came to India in the days Emperor Shāhjahān and entered the court of Mahābat Khān who was, then, the commander of imperial forces. He was treated with great respect and honour. He had developed very friendly and close relations with Mahābat Khān who took him with him on every expendition. He also accompanied Mahābat Khān for the conquest of Daulatābād. The fort defied the imperial forces for three months and was ultimately conquered by the strategy devised by Hakīm Niẓām ul-dīn for which he was credited. That honour aroused the anger and jealousy of Mahābat Khān who got his library burnt ablazed. The Hakim got so much dejected on that incident that he decided to return to his native town Gīlān. When he reached *Mahchī-Bandar* (presently Karāchī), he received the message of 'Abdullāh Quṭb-Shāh, the ruler of Bījāpur, inviting him to his court. On receiving assurances from the envoy, he changed his mind went to Golcunda. Quṭb Shāh showed so much respect to the Hakīm that he decided to stay there for ever. He died in Golcunda in 1649 A.D.[128]

Hakim Gīlānī has written on almost all subjects including philosophy, logic, poetry, literature, natural sciences, religion and medicine. His treatises are compiled in two books *Shijja-i Dānish* (448 pages) and *Aurag-i Dānish was binish* or *Majū'la-i Hakīm ul-Mulk* (in 336 pages.). He wrote both these books in Persian and Arabic. Persian version of the former has larger number of treatises than the Arabic one, namely 99 treatises. The work was written in the early period of his life. *Majūá-i Hakim ul-Mulk* has 16 treatise :

(1) *Dar Khāwāṣ baḍ Adwiya-i-Mufrada*
(2) *Chob Chīnī. Qahwa, Chai', Tambakū*
(3) *Risāla Magas wa Abrīsham*

(4) *Risāla Munā (Haqiqat-i-Harārat-i-Ghariza wa Sumizāi*
(5) *Haqiqat-i-Rūh wa Mas ala-i-Tanāsukh*
(6) *Haqīqat-i-Lazzat*
(7) *Qiyāfa Shināsī*
(8) *Risāla Khāl-o-Gosh*
(9) *Risāla Kīmiyā', Bhīmiyā, Sīmiyā*
(10) *Nikāt Mukhtalif Ṭibb wa Masāil-i-Kalliyāt wagherha*
(11) *Risāla dar Bāb Falsafa, Tabī 'iyāt, Rad-o-Barq*
(12) *Khawās-i-Adwiya Mufrada* for example; *Adwiya Mufrih-i-Qalb, Muqawwiyāt-i-Mi'dast Muqawwiyāt-i-Kabid*
(13) *Risala Rā'ul-ul Sa'at* (Arabic)
(14) *Risāla fī Ilāj-ul-Sudā'*
(15) *Tiryāq-i-Fārūa Mathriditūs*
(16) *Fiqh-i-Shi i wa digar Risā il Mutafarriqa*

Hakīm Niẓām ul-dīn Aḥmad Gīlānī had written another noteworthy work: *Ḥadiqat ul-salāṭīn.* It is a history in Persian of certain periods of Quṭb Shāhī dynasty. The monograph has been published by Saddiqi Press. It has been mentioned in the preface that four manuscripts of this book are extant in British Museum, India Office Library at London and Office of the Archaeological Department, New Delhi.[129]

Hakīm Gīlānī was also an expert architect and town-planner. He built a locality called *Ḥakīm pet* at a beautiful mountain site in the north of Golcunda fort which is a living memory of his art. He also built a castle, called *Qaṣr-i Jabal* on the hill top. He had given it also the name of *Jabal-i nūr* (Mountain of Light). The castle is an exquisite example of Iranian and Indian architecture.[130]

Hakīm Dāwūd Taqarrub Khān (d. 1663 A. D.)

Hakim Dāwūd was the son of Ḥakīm Ināyatullāh who was the pupil of Fathr al-dīn Shīrāzī (Mirzā Muhammad), father of Hakīm Ṣadrā and personal physician of Shāh 'Abbās Ṣafavī.[131]

Due to his expertise in medicine and in-depth knowledge of sciences, Hakim Dāwūd became a close companion of Shāh 'Abbās Ṣafavī, after the death of his father. Shāh Ṣafī and Shāh 'Abbās II (soccessors of Shāh 'Abbās Safavī) did not give due respect and attention to men of learning. The Hakim felt aggrieved and in 1053 A.H. (1644 A.D.) he came to India and entered the court of Emperor Shāhjahān who gave him the rank of Derh Hazārī (Officer having 1500 horsemen under his command) and Rs. 20,000 as a gift.[132] According to Shāh Nawāz Khān (quoting Hakim's son Muḥammad 'Alī), Shāhjahān used to give great importance to Hakīm Dāwūd because of his extra-ordinary skill in medicine.[133] Hakim Dāwūd had, along with a team of physicians like Hakim Momsna, Hakim Sadrā, treated the queen of Shāhjahān for high degree burns and other resultant complications

like hectic fever and *paroxysm.*[134] The treatment lasted for four month. After the recovery of the queen, Shāhjahān bestowed on him the rank of *Do Hazārī* (Officer having 2000 horsemen under his command), a horse with golden saddle and an elephant as gift.[135]

In the 31st year of his accession, Shāhjahān had developed some urine trouble (stranqurv). When treated by some court physicians other complications arose. They included constipation which could not be cured despite their best efforts. Ultimately Hakīm Dāwūd was called and the Emperor recovered soon. Shāhjahān was so much pleased at his recovery that he raised the Ḥakīm to the rank of *Panj Hazārı* (Officer having 5000 horsemen under his command).

Hakim Dāwūd also lived during the reign of Emperor Aurangzeb. He died in 1073 A.H. (1663 A.D.)[136]

Hakīm Masīḥ ul-Mulk Shīrāzī

The Hakim was the pupil of Hakim Najam-ul-dīn 'Abdullāh B. Sharf ul-dīn Hassan. He was a care free man and expert physician.[137] He came from Deccan to the court of Shāhjahān and went to Gujrāt with Prince Murād. He died in Mālwa.[138]

Emperor Auranzeb

Hakīm Ṣāleh Shīrāzī (d. 1673)

Hekīm Ṣāleh Shīrāzā was the native of Shīrāz. He was the son of the famous Ḥakīm Amir Fatḥullāh Shīrāzī.[139] He came to India during the days of Emperor Aurangzeb and received many fiifts and titles, including a "Sword"[140] and title of *Arsalān Khānī*[141] and the rank of *Sadī*[142] (Officer having one hundred horsemen under his cammand) which was raised to "*Dher Hazārī*" (1500 horsemen under command) in the 4th year of the accession of Aurangzeb to throne. He received the gift of a female elephant at the coronation of Emperor Aurangzeb.[143]

Hakīm Ṣlāeh died in 1083 A.H. (1673 A.D.).

Hakīm 'Abd ul-Razzāq (1706 A.D.)

Hakīm 'Abd ul-Razzāq came from Isfahān to India during the reign of Emperor Aurangzeb. After a short sojourn in Bareily and Lucknow, he settled down in Sindh where he died in 1117 A.H. (1706 A.D.)[144]

Hakīm Muhammad Amīn Shīrāzī

Hakīm Muḥammad Amīn Shīrāzī was one of the distinguished physicians who arrived in the court of Aurangzeb. He held a prominent position and received many favours from the Emperor due to his medical expertise and ability. In the 30 years of his age (according to Hijra era), the Emperor gifted Rs. 1000 to the Hakīm[145] and a robe of honour at another occasion.[146]

Hakīm 'Alavī Khān (d. 1747 A.D.)

His name was Muhammad Hāshīm and 'Alavī Khān was his title. He is essentially known by his title to all the students of Unani (Greek) medicine in India.

Hakīm 'Alavī Khān was the son of Muhammad Hādī. He was born in the month of Ramadhan, 1080 A.H. (1670 A.D.). After the completion of his studies in his native place, he came to India during the reign of Emperor Aurangzeb in the year 1111 A.H. (1700 A.D.). He received prominence in the days of Emperor Muḥammad Shāh who came to the throne of Delhi in 1131 A.H. (1719 A.D.). Due to his extra-ordinary expertise in medicine and other sciences, he was appointed as the personal physician of the Emperor who got him weighed in silver which was gifted to him. He was also given the rank of *Chha Hazārī* (Officer having 6000 horsemen under his command) and the title of *M'utamid ul-Mulk.*

When Nadīr Shāh attacked India in 1151 A.H. (1738–39 A.D.), he became sick on his return. He was treated by Hakim 'Alavī Khān at the instance of the Indian monarch. Nadīr Shāh offered him to return to Iran which he accepted on the promise that he would be allowed to perform Haj and pilgrimage at Mecca and Medina. Nadīr Shāh honoured his promise and sent the Hakīm on pilgrimage after some time.

Hakī 'Alamavi Khān again returned to India in 1156 A.H. (1743 A.D.) after performing the pilgrimage. He died in Delhi on 25th Rajab, 1160 A.H. (1747 A.D.) and was burried at the mausoleum of Nizām al-dīn Awilyā at his wish.[147]

The following works are known by Hakim Alavi Khan:[148]

(1) *Jām'i al-Jawām'i*

(2) *Khulasat al-Tajārib*

(3) *'Ashara Kāmila*

(4) *Qarabādin-l-Alavikhan*

Hakīm 'Alavī Khān also left a large number of tested prescriptions which were published by Naval Kishore Press in 1910 A.D. under the title *Collection of Tested Prescriptions of the Clinic of* Alavi Khān *Qarābādīn-i-Kabīr 'Alavī Khān*

Hakīm Shaykh Hussain Shīrāzī

The Hakim was of Arab origin but had come to be known as *Shīrāzī* due to his long stay and settlement in Shiraz. He was an expert physician and an excellent poet with a voluminous collections to his credit.

He arrived in India during the reign of Emperor Aurangzeb and was attached to the court of his son, Muḥammad Āẓm Shāh He attained great fame in

the reign of Emperor Farrukh Sīyar who bestowed on him the title of "*Ḥakim ul-Mulak.*"

Hakīm Dāwūd Isfahānī

Hakim Dāwūd needs a special mention among the physicians who came to India from Isfahān. He studied medicine in his native place Isfahān and was considered as one of the top physicians of the court of Shāh 'Abbas II. He came to India in the days of Aurangzeb and amassed great wealth. On return to his native land, he built a beautiful mosque in Isfahān which is known by his name.

In addition to the great experts who came to India from Gīlān; Tabrīz, Shirāz Iṣfahān and Kāshān, there came physicians to this land from other places from time to time and contributed to the progress of medicine here. Ḥakim Yūsuf ul-Mulk Lang came from Damāvand, Hakim Meshhadi,[149] Hakīm Jalāl ul-dīn Muẓaffar Ardistānī from Ardistan, on way from Isfahān to Kāshān.

Impact of Ibn Sīna's Major Medical Works on India

The study of Ibn Sīna's life history and his writings shows that he was a man of extraordinary talents and intelligence. This is why his fame and reputation has spreaded far and wide. He was really an encyclopaedia in the fullest sense of the word. Due to his popularity his books were translated, abridged and commented.

So far as his medical books are concerned, they have left their impressions not only on specific regions but also on the whole world. India is one of those important countries, where Ibn Sina's books are taught, had published in different languages. As a matter of fact, the medical educational institutions of India have played an outstanding role in introducing his views and thought, in the field of medicine. Indian physicians have written many books, several abridgements and commentaries in Persian, Arabic, Urdu and English.

The achievement of Indian people is that they did not only collect the old manuscripts of Ibn Sīnā but also took pains to print and publish them.

As a result of Ibn Sīnā's impact, the physicians tried to investigate and do researches on medicine. They along with the inclusion of useful drugs of other panthies, continued to find out new herbs and drugs.

The following are Ibn Sīnā's medical works which exist in India and have much importance according to medical point of view.

Al-Qānūn fil-Ṭibb (*Canon of Medicine*) : Among his medical works, this book occupies central place and is a voluminous encyclopaedia comprising about a million words. Here I would like to mention some useful and popular commentaries and abridgements.

Commentaries on Qānūn

(i) *Sharḥ al-Qānūn*, by Ibn Nafīs Al-Qarshi (d. 687/1288).

(ii) *Sharḥ al-Qānūn* (Hamīl al-Maṭn, Jāmī al-Sharhāin), by Muḥmmad b. Maḥmūd al-Āmulī (d. 635/1237).

(iii) *Sharḥ al-Qānūn*, by Hakim Álī Gīlānī (d. 1014 A.H.), who lived in India during the reign of Emperor Akbar.

Abridgements of Al-Qānūn

(i) Of all the abridgement of *Al-Qānūn*, the most famous in Ilāqī's (d. 460/1068) Ikhtiṣār Kitāb ul-Qānūn or Faṣūl Ilāqia, Muḥammad b. Yūsuf Taqī was a pupil of Ibn Sīnā.

(ii) The second abridgement of the whole *Qānūn* goes by the name of *Mūjaz min' al-Qānūn* by Ibn al-Nafīs Qarshī (d. 687/1288).

(iii) The third important abridgement is Qānūnchah by Sharf al-dīn Muhammad bin 'Umar al-Chaghmīnī (d. 745/1344).

The above-mentioned abridgement became so popular that many commentators wrote commentaries.

Aladwiyah al-Qalbiyah

By way of importance, this is next to *al-Qānūn* which Ibn Sīnā had written when he came to Hamadān after the year 405/1014. Due to its pupularity, it has been translated into, Urdu and English in Indian subcontinent. Its English version had been published by Hamdard Foundation Karachi in 1983.

Acknowledgement

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Notes and References

1. CA, p. 157-158.
2. CA, p. 159.
3. CA, p. 159.
4. CA, p. 159.
5. Muk R.
6. ASI, Vol. XXII, 1893-1912.
7. CA, p. 160.
8. CA, p. 160.

9. CA, p. 161.
10. *Tārikh-i Fīrūz Shāhī*, pp. 352-353 (CA, p. 161).
11. Dawal Rani Khizr Khān, p. 46.
12. CA, pp. 161-162.
13. TF, Vol. I, p. 75.
14. TF, Vol. II, p. 341.
15. BN (Trans.) I, p. 81, as referred by 'Abdur Raḥīm in *Islāmic Culture*, Vol. XI, No. 1 (1937), p. 81.
16. Stafford Northcote in the House of Commons as referred by 'Abdur Raḥīm in *Islamic Culture*, Vol. XI. No. 1 (1937), p. 81.
17. AA , p. 653.
18. AA, p. 644; MT, Vol. II, p. 120, 132.
19. MT, Vol. II, pp. 210-211.
20. AA, p. 315.
21. AN, Vol. II, p. 534 and Vol. III, p. 296. (qoted by 'Abdur Raḥīm in *Islamic Culture*, Vol. XI, No. 1 (1937) p. 82.
22. MR, Vol. I, p. 516.
23. Emperor Humāyūn was staying in the township of Lahore after his marriage with Ḥamīda Bānū Begum. Mirzā Hindāl had already gone to Qandhār at the invitation of its ruler, Farche Beg and Yādgār Nasser was also planning to go to Qandhar. Humayun deputed Ḥakīm Baqā to dissuade him from this journey. While crossing the river with his friends his boat was attacked by some persons who fired volleys of arrows from the Bakr fort. One of the arrows struck Ḥakīm Baqā and killed him. (AAM, p. 26).
24. MT, p. 119.
25. MSP, p. 378.
26. See STMI (Bibliography) p. 266.
27. MSP, p. 378.
28. N Kh, Vol. IV, p. 140.
29. MT, Vol. III, p. 161.
30. Ibid.
31. N Kh, Vol. IV, p. 141. But according to 'Abdu'l Faḍl, he went to Mecca at the order of Emperor Akbar (AN, Vol. III, p. 287).
32. BN, Vol I, p. 248.
33. Ibid, p. 245.
34. RA, Vol. I, p. 130.
35. N Kh, Vol. IV, p. 254.
36. Mu, Vol. I, p. 110.
37. N kh, Vol. IV, p. 254.
38. N Kh, Vol. 4, p. 254.

39. MU, Vol. I, p. 111.
40. N Kh, Vol. 4, p. 254.
41. MU, Vol. I, p. 112.
42. AA, p. 100.
43. Raḥmān and Alvī,
44. AN, Vol. III, p. 587. See also N Kh, Vol IV. p. 254.
45. MT, p. 27.
46. N Kh, Vol. IV, p. 10.
47. MT, Vol. III, p. 167.
48. Vol. I, p. 557.
49. MT, Vol. III, p. 167.
50. DA, p. 660.
51. MR, Vol. III, p. 847.
52. This is not the only commentary on Chaghmanī's work. Another was written by Sayyid 'Abdu'l Fatḥ
53. MT, Vol. III, p. 169.
54. Sh A, Vol, III, p. 60.
55. A place 5 miles from Abbotabad in N. W. F. P. of Pakistan.
56. Hasan Abdāl is a place near Peshāwar in Pākistān also known as Bābā Hasan Abdāl whose monastry (house of dervishes) was located nearby.
57. MU, Vol. 1. p. 559.
58. TF, p. 388.
59. MU, Vol. I, p. 565.
60. MU, Vol. I, p. 561-562.
61. MU, Vol. I, p. 568.
62 TJ, p. 151
63. MT, Vol. III, p. 168.
64. MU, Vol. I, p. 558.
65 Ibid
66. MT, Vol. I. p. 561.
67. MT, Vol. III, p. 169.
68. MA, Vol. I, p. 566.
69. MU , Vol. I, p. 566.
70. MT, Vol. III, p. 144.
71. It is said that he first came to Deccan and thence called to Agra by Akbar on the recommendation of Faydi, AAMH, p. 134.
72. AN, Vol. III, p. 357.

73. MU, Vol. I, p. 569.
74. AN, Vol. III, p. 261.
75. TJ, quoted in AAMH, p. 135.
76. It has been reported that in that tank, he had built an under-water room with a minaret and with a bridge on each side. However there was only one under-water entrance to this room and the door which kept open. The strange thing about this room was that despite the open door not a drop of water entered the room. Akbar had himself dived into the tank and examined the room (AN. Vol. III, p. 688). Emperor Jahāngīr has also mentioned in his Memoirs a simimilar tank with an under-water room built in Agra by Hakīm 'Alī Gīlānī (TJ, p. 74).
77. MT, Vol. III, p.. 169.
78. MR, Vol. III, p. 579.
79. MK, Vol. II, p. 38.
80. R Sh, p.
81. SA, p. MkH p.
82. AA, p. 188.
83. MR, Vol. II, p. 47.
84. Dh Kḥ.
85. AAMH, p. 111.
86. MU, Vol. I, p. 583.
87. MR, Vol. III, p. 845. 845. But Kautsar Chāndpurī (AAMH, p. 76) has given name as Muḥammad Ḥādhiq and 'Abdu'l Ḥamīd Lāhorī (BN, Vol. I, p. 184) has called him 'Abdu'l Khāliq.
88. N Kh, Vol. I, p. 126.
89. MU, Vol. I, p. 589.
90. MR, Vol. III, p. 585.
91. BN, Vol. I, p. 236.
92. MU, Vol. I, p. 585.
93. MU, Vol. I, p. 585.
94. AA, (Eng. Trans), p. 474,
95. N Kh, Vol. V, p. 126.
96. MR, Vol. III, p. 46.
97. MU, Vol. I, p. 566.
98. MR, Vol. III, p. 51.
99. AAMH, p. 201.
100. AA, p. 188.
101. TA, Vol. II, p. 481.
102. MT, Vol. III, p. 167.
103. AA, Vol. I, p 234.

104. AS, Vol. I, p. 32.
105. N Kh, Vol. V, p. 147.
106. MR, Vol. III, p. 45, 48.
107. MR, Vol. III, p. 44, 45.
108. MR, Vol. III, p. 46.
109. Ibid, p. 48.
110. TJ, p. 383.
111. BN, Vol. I, p. 441.
112. BN, Vol. II, p. 11.
113. BN, Vol. II, p. 334.
114. AS, Vol. II, p. 77.
115. BN, p. 638-39; MU, Vol. II, p. 797-798.
116. BN, p. 348.
117. TJ, p. 75.
118. AAMH, p. 121.
119. AS, Vol, III, p. 394.
120. TJ, p. 339.
121. BN, Vol. I, p. 441.
122. MR, Vol. III, p. 43.
123. TJ, p. 35.
124. BN, p. 35.
125. MT, Vol. 3, p. 169.
126. AAMH, p. 158.
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131. BN, Vol. III. p. 388.
132. AS, Vol. III, p. 388.
133. MU, Vol. III, p. 625.
134. BN, Vol. II, p. 368.
135. AS, p. 418.
136. AAMH, p. 90.
137. MT, Vol. III, p. 165.
138. TA, Vol. II, p. 395.
139. AS, Vol. III, p. 396.
140. AN, p. 294.

141. AN, p. 635.

142. AN, p. 636.

143. AN, p. 404.

144. YB, p. 420.

145. AN, p. 567.

146. Ibid, p. 626.

147. AAMH, p. 207.

148. AAMH, p. 207.

149. MR, Vol. III. p. 243.

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INTERACTION BETWEEN INDIA AND CENTRAL ASIA IN THE FIELD OF MEDICINE

P. V. SHARMA

Even in the pre-Christian era there were commercial links between India and the other countries, and the Indian sailors used to frequent the maritime route. Some of them also settled on the distant soils.[1] Apart from the sea route, the intertwined land routes were also important, as evidenced by the early texts[2] of the period. Among the land routes, the northern route, was an important one which was commonly known as the *Uttarāpatha*,—a route which joined Central Asia in the north, India in the south, China in the east and Caspian sea in the west.[3] A branch of the Grand or the Himalayan route connected Takṣaśilā with Bāhlīka.[4] The famous silk road from China joined it passing through Kamboja, further via Caspian sea and Black sea and thence to Europe.[5] Bāhlīka was situated in the north-west and Kamboja in the north-east of Hindukush.[6] Thus Central Asia was by and large, composed of ancient Bāhlīka and Kamboja which extended from Bukhara to Yarkand and Khotan.[7]

Through these routes India had direct links with Central Asia. Pāṇini (5th cent. B.C) in his *Aṣṭādhyāyī* mentions Kamboja and its king, which means that the people of India were quite acquainted with the affairs of that country. Likewise, the people of Bāhlīka were also quite mixed up with Indians so that even some members of the royal dynasty were named as Bāhlīka.[8] In the *Mahābhārata*, the *Kambojas*, the *Bāhlikas* and others inhabiting Central Asia, participated, with commensurate presents, in the grand *Rajasuya* sacrifice performed by Yudhisthira (MBL. II. 51.3, 26, 30). 'Bāhlīka' is also referred to the *Śatapatha Brāhmaṇa* (XII. 9.3.3). Rajasekhara quotes a verse which has reference to the women of Bāhlīka.[9]

The Śakas, a nomadic tribe of Central Asia which entered India in the second cent. B.C.[10] and attained a dominant position there till the fourth cent. A.D. had also great impact on Indian culture. Their contribution to Sanskrit prose, astronomy and even commerce is well known;[11] but their major contribution lies in the field of medicine. The Śakas were sun-worshippers who also gave impetus to the worship of the sun-god for which sun-temples were established in different parts of the country, the first being in Multan. As there was no sect of *brāhmaṇas* entitled to act as priests in these temples, the *brāhmaṇas* known as *magas* from Śakadvipa were invited specially for this purpose.[12] It is important to note that the son-god is related to health, and the sun temples are the seats of medicine.[13] Even today the people cautions of their health or suffering from some ignoble disease like leprosy, observe fast on sundays and offer special prayers to the god on the occasion of *Sūryasaṣṭhi* (the sixth day in the bright fortnight of *Kārtika* and *Chaitra*

months). There is a legend in the *Sāmbapurāṇa* (ch. 26) according to which when Samba, the son of Lord Krishna, got affected with leprosy, the Lord sent him on his *garuḍa* to fetch the *brāhmaṇas* from Śakadvipa who, having reached the place; settled on this soil. In the light of these facts, it becomes clear that the *brāhmaṇas* were experts in medicine who carried along with them the traditional knowledge of medicine prevalent in Central Asia. Even to-day, the *Śākadvipīya brāhmaṇas*, who mostly settled in Magadha (Bihar), are traditional physicians. Though there is a controversy in the geographical identification of *Śakadvipa*, the view that it consisted of the region of Central Asia around Caspian sea[14] seems to be reasonable.

The Śakas opened new trade-routes from India leading to Central Asia which gave impetus to a viable intercourse between these two countries.[15]

Perhaps 'Kanka'[16] was the prevalent title of these *brāhmaṇas* who migrated from Central Asia. In the *Caraka Saṃhitā* a physician of Kanka clan from Bāhlīka has been referred to as participating in more than one symposia. Bhattara Hariscandra, the illustrious and the first known commentator on the *Caraka Saṃhitā* was also a physician from Bāhlīka belonging to the same clan. King Candragupta II or Vikramaditya extended his empire up to Bāhlīka and patronised the Kankas in India probably on account of their meritorious services to the people and, after his death, a depression descended upon them.[17]

Vāgbhaṭa in his *Aṣṭāṅgasaṅgraha* makes a reference to a Śaka King[18] and also *śākāṅganā*[19] which shows that by then the śakas were well established in this country. Garlic is said to be the native of Śakadeśa.[20] Later on, the word *śaka*, like Yavana, was used to denote the foreigners including muslims.[21]

Till the early medieval period, Central Asia was under the influence of Buddhism which went from India. This was more dominant under the region of the Kuṣāṇas, who were an offshoot of the Śakas. King Kaniṣka, the most illustrious among them, extended his empire up to Central Asia.[22] A Buddhist as he himself was, Kaniṣka sent Buddhist emissaries[23] not only to different parts of the country but also abroad and Buddhist *Vihāras* there. In course of time Central Asia became noted for a number of such *vihāras* when Huan-Tsang visited the country.[24]

The Buddhist monks, like Christian missionaries, rendered medical help to the people apart from the rreligious sermons and practices. These *vihāras* too served as the seats of temple-medicine. The Buddhist monks carried in their bag not only some handbooks on medicine but also some instruments and important drugs. The *Nāvanitaka* and other two medical works discovered by Bower as part of the Central Asian manuscripts[25] were most probably some of such handbooks on medicine used by monks and other health workers. Another important work is the *Siddhasāra* of the Buddhist scholar-physician Ravigupta which was unearthed in

the form of manuscripts in Khotanese language and other scripts.[26] These monks, on their return journey, brought with them important relevant information regarding medicine along with useful drugs.

Thus the Buddhist monks served as an important media of exchange of medical knowledge as well as drugs between India and Central Asia. During the Kushan period, the following drugs were exported to Central Asia from India by land route: black pepper, valerian, cinnamon, cardamom, ginger, clove, *aguru* and indigo. Some drugs like clove and cinnamon were brought from south-east Asian islands also and were transported to other countries.[27]

Under the dynasty of Samanids, Bukhārā was the capital and for long it remained a cultural centre too.[28] During the medieval period, the prosperous trade attracted the Central Asian rulers and invaders to the wealth of India. Among them, Maḥmūd of Ghaznī (997-1032 A.D) is notable during whose times al-Bīrūnī visited India and made a close study of the country, leaving behind his valuable memories.[29] He had the Arabic translation of the *Caraka Saṃhitā* and studied it. He also translated a Sanskrit treatise on medicine into Arabic. Maḥmūd perhaps even took a number of scholars with him to Central Asia. Later the Ghorīs also followed (Muḥd Ghorī 1206-9 A.D.) suit. Bābur, who founded the Mughal empire, came from Central Asia and brought with him important traditions including medical practices of that country.

During this period, the Arab traders had monopolised the trade of commodities including drugs. They exported indigenous products of India like myrobalans, coconut, betal leaves. and nut, sandal. agar, black pepper, *galangal*, cinnamon and other medicinal and aromatic substances. As in the past, camphor, clove and nutmeg were procured from other countries, but also exported from India to other countries including Central Asia.[30]

Central Asia acted as a medium of intercourse between India and Russia, Many medical principles and practices were the same in both the countries of which the following are noteworthy:

(i) *Cucumis sativa* was used as diuretic in Russia and the same has been described as a good diuretic in Indian medicine too.[31]

(ii) In 17th cent. A.D. the Russian medicament consisted of opium, aloe, manna, bitters, gums, mustard, dill seeds, cinnamon, clove etc. which is similar to that of Indian medicine.[32]

(iii) Use of animal tissues and organs are prescribed in Indian medicine as early as in the *Caraka Samhita*.[33] In Russian medicine too, the use of wild liver in curing night blindness,[34] blood in the case of blood loss, powdered organs and boiled testicles of animals to cure impotency[35] were prescribed.

(iv) The use of metals and minerals like copper, gold, silver and mercury is seen in both the systems of medicine.[36]

(v) Blood-letting is prescribed in Indian medicine since early times. Russians also used it from time immemorial.[37]

(vi) Surprisingly enough both Indians and Russians understood the infectious nature of small pox, consumption, leprosy and fevers.[38]

The following substances which enter into Indian medicine are important from the historical point of view particularly in relation to the exchanges between Indian and Central Asia.

(i) *Kuṅkuma* (*Crocus sativus Linn.*): It is commonly known as *Kesara* (saffron). Its synonym *Bāhlīka* indicates its ecological and commercial relation with the region of Bāhlīka, a part of Central Asia. Saffron was grown there at that time. Even Kalidāsa (4th cent. A.D.) has recorded it as growing on the bank of Oxus in one of his important works.[39] Bāhlīka also acted as a distributing centre of saffron coming from other countries. Though Bāhlīka is synonym for both *Kuṅkuma* and *Hiṅgu* (asafoetida), Dṛḍhabala uses it only for *Kuṅkuma* which shows that the primary use of the synonym was for *kuṅkuma* alone. It is important to note that the medicinal use of saffron started with Dṛḍhabala, the redactor of the *Caraka Samhitā*, because both *kuṅkuma* and *bāhlīkā* are found in Dṛḍhabala's version only. Perhaps during the Gupta period, saffron started being cultivated in Kas͟hmīr. Huan-Tsang has observed[40] it and Amarasimha has also recorded it.[41]

(ii) *Hiṅgu* (*Ferula foetida Regel*), the strong smelling oleo-resin of the plant is used as spices and drug. It grows in arid zone. The original habitat of the plant is Central Asia in the region of Buk͟hārā between Caspian sea and the sea of Aral.[42] Vāgbhaṭa says that *hiṅgu* grown in *Boskānadeśa* (Bok͟hārā and adjoining region) is regarded as the best one.[43] The synonym *rāmatha*[44] suggests that its habitat as *Ramathadeśa* which might also have been a part of Central Asia. Though both these synonyms (*bāhlīka* and *rāmatha*) for *hiṅgu* are absent in *Caraka Samhitā*, *hiṅgu* itself is used in a large number of formulations. This shows that during the period of Caraka and even earlier, India had been importing asafoetida for Central Asia. The gradually increasing importance of Bāhlīka as a trade centre led to the prevalence of the name 'Bāhlīka' for these commodities (saffron as well as asafoetida).[45]

(iii) *Madhuka* (*Glycyrrhiza glabra Linn.*):

This is commonly known as *Madhuyasti* or *mulethi* and by the trade name liquorice. *Madhuka* has been in common use as drug in Indian medicine since early days, its frequent use is mentioned in the *Caraka Samhitā* as a single drug or an ingredient of compound formulations. But as it does not grow in India even

today (on a commercial scale), it is evident that it was imported from other countries. Patanjali (c. 2nd. cent. B.C.) in his annotation on Pāṇini's *Aṣṭādhyāyi* has given an important clue regarding the trade of this drug. He says that *Madhuka* is transported by the land route and so in *marice* (black pepper).[46] This import was mainly through the grand route from Central Asia. Even today liquorice is imported from Russian Central Asia, Iran and Spain.

(iv) *Bhāṅgā* (*Cannabis sativa* Linn.) is a plant which is a native of Central Asia. It is said to have been used and dispersed by Scythians.[47] It is found in the *Atharvaveda*[48] (XI. 6.15) and later in Kātyāyana's *Vārtika* on Paṇini's *Aṣṭādhyāyī* (V. 2.29). It is also mentioned in the *Amarākośa* (II. 9.20) where it is interpreted as *śaṇa* (hemp) by Ksīrasvāmi (11th century A.D.). Thus it is evident that *Cannabis sativa* was introduced into India quite early but initially it was used only for the strong fibres[49] and not as a drug; because, in the ancient *saṃhitās* of Āyurveda, no mention of *bhāṅgā* is found. Its popular synonym *Vijayā* who used for *harītakī*. It was in the medieval period that *bhāṅga* began to be used as a drug for curing dysentery, insomnia and sexual debility.

(v) *Pārasīka yavāni* (*Hyocyamus niger* Linn.) :

This is commonly known as *Khurāsāni ajawain* (because this plant is a native of Khurāsān and the adjoining areas in Central Asia,[50] and was introduced into India in the early mediaeval periods, because the drug is found first in the work *Siddhayoga*) of Vṛṇda (10th cent. A.D) for the treatment of intestinal parasites.[51] At present, this is also used as intestinal antispasmodic, analgesic and hypnotic.

vi) *Priyaṅgu* (*Prunus mahaleb* Linn.)

Priyaṅgu denotes both a kind of millet and a plant-drug. It is referred to in both the senses in the ancient texts of the Ayurveda. *Prunus mahaleb* is found naturally in Central Asia. The seed kernels are aromatic and were being used by the women in Sindh as a garland and as a paste like that of sandal.[52] The stem part is used as a drug. However, because of the difficulty in its availablity, it was superseded by another plant drug (*Callicarpa macrophylla Vahe*), the fruits of which resemble the millet and are used now a days in medicine.

(vii) *Kāmbojī* : Understandably, this means a plant found in Kamboja (Central Asia). It may be some kind of a grass used as fodder for horses which are common in Kamboja. It is not mentioned in the *Caraka Saṃhitā*. In the *nighaṇṭus* it is a synonym of *māṣaparṇī*. Vaidya Bapalal has identified it as *Breynia patens Benth* known as *janbiu* in Gujarāt. On the basis of a synonym *Hayapucchikā* it could be a *Aristida setacea Retz* which appears like horses tail and is appropriately also called *ghora-lenji*.

(viii) *Turuṣka*—(*Styrax officinalis Linn.*): It is mentioned only once in Dṛḍhabala's portion of the *Caraka Samhitā* (Ci. 28.183) among the aromatic drugs. It is an exudation of a tree found in the Asia Minor, and is known as solid storax. The

liquid extract known as *śilārasa* (*silhaka*) is obtained from a different tree (*Liquid amber orientalis Miller*) found in the same region. The *Dhanvantarī Nighaṇṭu* gives *Yavana* (grown in *Yavanadeśa*) as one of its synonyms. It is believed that till the first century A.D. it was being imported to India through Red sea. It is not improbable that the traders visiting Asia minor, transported it through Bāhlīka to India. As it was obtained from Yavana country through Yavana traders, it was duly named the *Yavana*.[53]

(ix) *Aśvabalā*—(*Midicago sativa Linn*) :

The plant is grown in the south of Caucasus, Irān, Afg͟hānistan etc.[54] It seems to have entered India through the land route in Central Asia. It is mentioned by Caraka only once in the context of *divya oṣadhis*[55] (celestial herbs). By the time of Suśruta, it became popular and hence Suśruta mentions it thrice[56] as a vegetable. Since it was also used as a fodder for horses, it took the name *aśvabala* (tonic for horses).

Horses of Kamboja were famous and it was natural that this important fodder was given to them. It may be noted that the region of Caucasus and the adjoining area was known as *devabhūmī*. The *brāhmaṇas* migrating from Śakadvīpa call themselves the *divya brāhmaṇas*, and the herb from the region is also known as *divyadoṣadhi*. In tune with this, Kus͟hana kings belonging to that region were called the *devaputra*.

(x) *Revanda*—(Rheum emodi wall) :

This was also introduced through Central Asia in the medieval period, and the ancient texts refer to it as *āmlikākanda*[57] and in the later texts call it, *pitamuli, āmlaparṇi, revatika*.

(xi) *Rasona*—(*Allium sativum Linn.*) :

Garlic is native of Central Asia, but naturalised in India long ago. The early texts mention it, but Vāgbhaṭa in his *Aṣṭāngasamgraha* (Uttara. 49.103) speaks of a variety of Śakadeśa to be used in *rasāyana*. It is to be noted that one of the medical texts discovered by Bower in the Central Asian region deals first with the praise of garlic.

These apart, some fruits used as drug also came from Central Asia to India. Buk͟hāra, Samarqand and K͟hwarazm and other places of Central Asia had been important centres for the supply of fruits like apricots, plums, grapes, pomegranets, almonds and melons.[58] It is interesting to note that the chapter on fruits in the *Caraka-Samhitā* starts with *drākṣā* (grapes), while the *Suśruta-Samhitā*, with *dāḍima* (pomegranates) both of which were products of the north-west. Though a portion of Afghanistan was a part of greater India which was rich in these fruits, there is every probability that the superior quality of this fruit was obtained from Central Asia. The good quality of plums (*ālūbukhāra*) is still known by the place Buk͟hārā,

Siñcitikā described as a fruit by Caraka and Suśruta as a big variety of *Badara* may be some good variety of plum, though some writers have erroneously identified it as apple.

Melons were introduced into India from Central Asia probably by the Ghaznavis or the later invaders. Khwārazm was the main centre for its export. It has been described in the (*Madanapāla Nīghaṇṭu*)[59] (14th cent. A.D.) and the *Bhāvaprakāśa Nighaṇṭu*[60] (16th cent. A.D.) by the name of *Kharbūja*, sanskritised under the name *ṣaḍbhujā*[61]. The seeds are used as diuretic and soothing. The Mughal emperors were also fond of this fruit and obtained the best quality from Khwarazm.[62] It would seem that at the time of Bābur India did not grow muskmelons [63]

Amṛtaphala (*nāspāti*) is mentioned as *Amrudphala* in *Bāburnāmā* [64] This is the same as *tanka* described by Caraka and Suśruta. Some commentators have wrongly assumed it as guava which was introduced into India by Portuguese in the late 16th cent. A.D.

Gājar (*Daucus carrota Vr. sativa D.C.*), which nowadays is a very common vegetable, was not known in ancient India. It is a native of Siberia, Arabia, Europe, Abyssinia and North Africa.[65] Most probably it entered India through Central Asia.

Of the commodities of export, the following are notable; myrobalans, coconut, betal leaves and nut, cubab, sandal, agar, black pepper, *galangal*, cinnamon and other medicinal and aromatic substances. Camphor, clove and nutmeg were procured from other countries, and exported from India to other countries including Central Asia. In addition to them, *dāruharidrā*, ginger and long pepper were also important articles of export.[66] As to *marīca*, (black pepper), Pātanjali says that it was transported by land route. Thus it is evident that black pepper which grows abundantly in South India was exported to Central Asia and other countries by land route even in the second century B.C. As liquorice and black pepper are mentioned together, it may be assumed that they were exchanged with one another.

Notes and References

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2. *Kauṭilya Arthaśāstra* II. 6.8; Upadhyaya B. S. : *Kalidasa ka Bharat*, Calcutta, 1964 (3rd ed.), Vol. II, p. 79.
3. Vasudeva Sharan Agrawal's Introduction (p. 3) to *Sarthavaha*, Motichandra, Patna, 1953.
4. *idem*, p. 11
5. Jayaswal and Banerjee-Shastri, *op. cit.*, p. 62; Puri, B. N. *India under the Kushanas*, Bombay 1965, p. 116.

6. Agrawal V. S. : *Pāṇinikālīna Bhāratavarṣa*, Varanasi, 1969 (2nd ed.), p. 60.

7. Rajasekhara has mentioned Bāhlīka as one of the places in *Uttarāpatha* (Northern region) along with its inhabitant *Śakas*, *Kāmbojas*, *Bāhlīkas* etc. the plants such as pine, cedrus, grapes and saffron.

8. *Śrīmadbhāgavata Purāṇa*, Gorakhapur, 1961 (4th ed) IX, 22. 12.

9. Rajaśekhara : *Kāvyamīmāṃsa*, Varansi 1959 (2nd ed.), p 291.

10. The waves of the Scythian migration may be traced back in history to about the middle of the 8th century B. C.

11. Upadhyaya B. S. : *Guptakāla ka Sāmskritika itihāsa*, Lucknow, 1969, p. 45.

12. *ibid*, pp. 39-40. Also see Varāhamihira, *The Bṛhat Saṃhitā*, Varanasi, 1959,60.19.

13. Thomas Jatters : On *Yuan-Chwang's Travels in India*, Chinmulgund and Mirashi, *Review of Indological Research in* 75 *Years*, Poona, p. 720. Some scholars take it also a homeland of Aryans (see Thakur and Sharan : *Prācīna Bhārat*, Varanasi, 1979, p. 123).

14. Others take Sakadvīpa a Indus Delta or Seistan. (see E. D. Rapson (Ed.) *The Cambridge History of India*, 1922, Vol. I, p. 564.

15. Chattopadhyaya, S. *op. cit*. p. 78-83.

16. According to *Medinīkosa* (I. 19), 'Kanka' means spurious or a disguised *brāhmaṇa*. In the *Mahābhārata* (IV. 1. 24), Yudhisthira decides to disguise himself as Kanka. According to another view, Kankas may probably be identical with kang-kiw the residents of Sogdiana. Shashiprabha Asthana : *History and Archeology of India's Contact with other Countries from earliest times to* 300 *B. C.*, Delhi, 1976, p. 156. There was one physician named Kanka at Baghdād during the time of Khalīfa Hārun-ul-Rashīd, *during* 786-808 *B. C.* (see Sachau : *Alberuni's India*, Delhi, 1964, Preface XXX-XXXII). Caraka : Sūtra. 25.22, 26.5, *Śārir*. 5.18

17. Gray Ouis H. : Subandhu's *Vāsavadatta*, Delhi, 1962, (7).

18. Vāgbhaṭa : *op. cit*. 49. 136, 50.79.

19. Vāgbhaṭa : *Astāṅgasaṃgraha*, Varanasi, 1962, *Uttara*. 49. 135.

20. *ibid*, 49. 193.

21. Bhattacharya D. C. : *Date and Works of Vāgbhaṭa-the Physician*, *A. B. D. R. I.* Vol. XXVIII, p. 125.

22. Smith V. A. : *The Oxford History of India*, Oxford, 1964 (3rd ed.) Book I, pp. 173. 178.

23. Dharmayasas, Buddhayasas, Gautama Prajuairuci, Jinagupta, Narendrayasas and Dharmagupta are a few notable ones who visited Central Asia (Motichandra, *Santhavaha*, Patna, 1953, p. 186. 188.

24. Watters Thomas : *On Yuan Chwang's Travels in India* (A. D. 629-646), Delhi, pp. 264-304.

25. Jolly Julius : *Indian Medicine*, Delhi. (2nd ed.), 1977, pp. 18-19.

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27. Sharma P. V. : *Scientific History of Āyurveda* (Hindi), Varanasi, 1981 (2nd ed.), p. 353-354.

28. Rahul Samkrityayana : *History of Central Asia*, Calcutta, 1964, p. 195.

29. Sachau. *op. cit*. Preface, XXXV-XXXVIII.

30. Sharma P. V. : *Op. cit*, p, 255.

31. Ravitch Michael L. : *The Romance of Russian Medicine*, New York, 1937, p. 23.

32. *ibid.*, p. 55.

33. *The Caraka Saṃhitā*, Bombay, 1941 (3rd ed.) *Sārir*, VI. 16; *Cikitsā*, II. 1. 42, 50; 2. 10, 28.

34. *ibid*, p. 23

35. *ibid*, p. 32-33.

36. *Ibid* p. 27-28

37. *ibid*, p. 29

38. *ibid*, p. 25 *Suśruta Saṃhitā* Bombay, 2938 (3rd ed.), *Nidāna*, VI. 33.34.

39. Kālidāsa : *Raghuvaṃśa*, Varanasi, 2076, IV. 67.

40. Watters Thomas : *op. cit.*, p 261.

41. Amara Simha : *Amarakośa*, Bombay, 2905. (3rd ed) II. 6. 124.

42. George Watt : *Dictionary of Economic Products of India* London, 2882-2893, Repr, Delhi, 2972, Vol. III, p. 335

43. Vāgbhaṭa : *Opcit Sūtra*, 12, 67

44. Sharma P. V. (ed) : *Dhanwantari Nighaṇṭu*, Varanasi 1982, 2.36

45. Hieun-tsang observed both growing together (see Thomas Watters, op. cit., p. 264-265.

46. Patanjali. *Vyākaraṇa Mahābhaṣyā*, 1963; V. 1.77

47. Candolle A. D. : Origin of Cultivated Plants, 1959 (2nd ed.) pp. 148-149. George Watt : *op-cit*, pp. 123-8. Watt is wrong in commenting that during ancient times the plant was cultivated chiefly for its narcotic properties and it was used as medicine in Suśruta.

48. In *Ṛgveda* (IX.61.13) 'Shanga' is used in the sense of fermentation (abhisavamarda).

49. Watt : *op. cit*, Vol. IV. p. 319

50. Vrnda : *Siddhayoga*, Poona, 2943 (2nd ed), VII. 1.

51. Watt : *op. cit*, Vol. VI. pt. I. p. 348

52. It was used extensively in perfumery. See Varāhamihira : *Bṛhat Saṃhitā*, Varanasi; 77.9 23.26, 30.

53. Watt : *op. cit*, Vol. V, p. 200.

54. Caraka : *op. cit*, *Cikitsā*, 46.261, Cikitsā. 1.183, 6.5

55. *Suśruta* : *op. cit*, *Cikitsā*, 1.4.7.

56. *Suśruta* : *op. cit.*, '*Sutra*' 46-261, Cikitsā. 1.183, 6.5

57. *Caraka op. cit.*, Sūtras., 27.

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64. It is described as such in the *Madanapālanighaṇṭu* (VI. 59), Watt states that *Bihi* (Cydonia vulgaris) was known as '*Amrud*' in Persian and grew near Caspian Sea. (*op. cit.*, Vol. 1. II, p. 676).

65. Watt. *op. cit*, III, p. 44-45.

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CENTRAL ASIAN DOCTORS OF IBN SĪNĀ EPOCH

U. I. KARIMOV

The people of Middle and Near East in the early Middle Ages achieved considerable successes in the domain of medicine, chemistry, pharmacology and some other related sciences. The historians of science determined, that the scientists of so called "Muslim Orient" not only surpassed their Greek and Byzantine predecessors but also they defined, through their capital works, the path of scientific development for future ages.

There were scores of names of prominent doctors who lived in various eastern countries in the 9th-13th centuries and who had left an indelible mark in the history of medicine. But the most flourishing of this science was during the 9th-11th centuries and the most celebrated Central Asian scientist and encyclopaedist, Ibn Sīnā, lived and made outstanding contributions in the latter half of this period.

His appearance was not a single phenomenon. His scientific activities were taking place in the scientific environment of savants of different specialities, including doctors. Therefore, for a detailed and authentic study of the development of medicine in Central Asia of Ibn Sīnā's epoch, it is necessary to extend the limits of investigation by making comparative analysis of all of Ibn Sīnā's medical works, (first of all his "*Canon*") and those of his contemporaries and predecessors.

In this article, an attempt has been made to discuss briefly the five prominent representatives of Central Asian medicine of Ibn Sīnā's epoch.

A fact of great significance concerning the Central Asian medicine's situation especially in Bukhārā of Ibn Sīnā's epoch, is the study of the work of his predecessor and contemporary, Abū Bakr Kasī ibn Aḥmed al-Ahavayanī al-Bukhārī, who lived and worked in Bukhara. As Bukhārī has himself stated, he was a pupil of one of the followers: al-Bāzī (805-925). In view of this, some investigators incline to the view that al-Bukhārī lived in the second half of the tenth century. In any case he was a great doctor of his time, who successfully treated specially melancholia and was called by his contemporaries "the doctor of the madmen" (*pezeshki divānagān*).

Al-Bukhārī's great work, entitled *Hidāyat al-mut'a 'allimīn fi-l-Tibb,* (The Guidance for the Study of Medicine) in Persian, has been preserved and it is the oldest among all the surviving medical works which were written in Persian. The manuscript was redacted and published in 1965.[1] In this work there are almost

all the domains of medicine of that time—questions of general theory, description of diseases and the methods of their treatment. The author often gives the results of his practice and even disputes with his predecessors. This work has a special significance for the investigation of Persian medical terminology of that time.

The next medical person, is Abū Ábdullah al-Nātalī, who was known mainly as Ibn Sīnā's house teacher. He taught the latter the principles of geometry, logic astronomy and philosophy. But Ibn Sīnā was not satisfied with his teaching because, as he himself wrote in his autobiography[2], he in many respects comprehended better than his teacher. Nevertheless, it was Nātalī who first observed young Ibn Sīnā's talent as well as his great scientific capabilities and cautioned his father against entrusting his son with any work, except science.

But the main merit of Nātalī's in the history of science consisted of his new edition of the Arabic translation the work of Dioscorides (first cent.), the Greek doctor and pharmacologist, on *Medicinal Remedies*. This work had been rendered into Arabic from Greek by Istifan ibn Basila in Baghdād during the rule of Abbasid' Caliph al-Mutavakkil (847-861 A. D.) and then his translation was edited and improved upon by Hunayan ibn Isḥāq (808-873 A. D.)[3].

Istifan ibn Basila's translation had one defect. Many Greek names of medicinal remedies were remained in Greek terms without change, because the translator was not aware of their Arabic equivalents. Al-Bīrūnī (973-1048 A. D.) also knew these lacune and desired explanations for them.[4]

It is interesting to note that, in Ibn Sīnā's second book of *Canon* is also in al-Bīrūnī's *Pharmacognosy*, there are Arabic and local names of medicinal remedies instead of Greek names as in Istifan's text of translation. Ibn Sīnā also very often quoted Dioscorides. It would be incorrect to speak of loan-words of each other and as is well known, al-Bīrūnī also has taken quotations directly from the Arabic translation of Dioscorides' work, as evidenced by his statement in his preface.[5] Thus, it is conceivable that another new edition or adaptation of Istifan's translation, could well here been used both by Ibn Sīnā and al-Bīrūnī.

Such a rehashing was made in the tenth century in Cardova by Arabo-Spanish scientists (al-Bīrūni and Ibn Sīnā were not aware of it)[6] and in Samarq and. The latter was written by Abū Sīnā's teacher and the author of the adaptation of the Arabic translation of Dioscoride's work was one and the same person.[7]

The sources attributed to Nātalī's several works touching upon some philosophical and alchemical questions. Besides other sciences, he studied medicine and his teacher was the renowned doctor and philosopher Abū-l-Faradj Ibn al-Tayid[8] (1043 A. D.). The latter knew Greek and had profound knowledge of the works of ancient authors; he wrote notes on the works of Aristotle, Hippocrates and

Galen.[9] In respect of some medical problems, Ibn Sīnā dispute with Abū'-l-Faradj and wrote a special treatise on this theme.[10]

Four lists—two of them complete and the other two partly of the above-mentioned Nātalī's redaction of the Arabic translation of Dioscorides' work were compiled.[11]

The Leiden list is the most ancient and complete the introduction and colophon of which have been published in 1979.[12] The manuscript was rewritten in (1083 A. D.) from Abū Ábdullah's autograph. This autograph was done in 990 A. D. in Samarqand and was presented to Samanid's Vice-Regent and Turkish military leader AbūÁli as-Simdjūrī (986-997 A. D.).[13]

In his Introduction, after praising as-Simdjūrī, Nātalī wrote that, because of his being experienced in the works of ancient scholars, Abū Álī as-Simdjūrī asked him to correct their translations and correspondence. For instance, on the order of Abū Álī as-Simdjūrī, Nātalī corrected and redacted Dioscorides' work, on the Medicinal Remedies. Nātalī states that he rewrote the book and incorporated all the illustrations.[14]

In this introduction, there were absent other details about the Nātalī's own achievements and therefore, it is very difficult at present to determine what was his redaction. It can be made clear by comparing his text with that of Istifan's and Hunayun's translation.

In so far as Nātalī supplied his text with the pictures of described animals and plants, it could be supposed, that he paid main attention, probably, to the change of the Greek names of plants into their local equivalents.

One of Ibn Sīnā's teachers in the domain of medicine was Abū Manṣūr al-Hasan ibn Nuḥ al-Qumrī. Ibn Sīnā had interacted with him in Bukhārā. Ibn Abī Usaybi spoke well of him and considered him as a renowned doctor of his time. He even wrote that Ibn Sīnā had no match in medicine and that he was a talented man both in theory and practice of medicine.[15] Al-Qumrī was born and lived in Bukhārā and was held in esteem by the Samanid's rulers especially Amīr Manṣūr (probably, Manṣūr I ibn Nūḥ, who ruled in 961-976 A. D.). He even had access to harem in case of the necessity of medical help by its inhabitants.[16]

In his youth, Ibn Sīnā met al-Qumrī when he was an old man; yet, he attended Qumri's lectures on medicine and learnt very much from him.[17] Al-Qumrī died in about 999 A. D.[18] and was buried in Bukhārā.[19]

There are two works of al-Qumrī,[20] *Kitāb al-ghinā' va'-l marā'* (The Sufficient and Desirable Book) and *Kitab-at-tanvīr fil isṭalahāt a Jibbiya* (The Book of Life and Death). The first is also called *Kunnāsh* and *Shamsiya al-Manṣūriya* and has

come to us in the form of a great number of manuscripts, one of them being in Leningrad and the other in Ta<u>sh</u>kent in the Institute of Oriental Studies of UzSSR. It is rather a voluminous work (the Tashkent manuscript has 155 sheets, each of 27 lines, 18 × 26 centimetres; inventory number of this manuscript is 5708). This work gives the description of treatment for all the illnesses of human organism. In the Introduction al-Qumrī writes that from his youth, he was fond of natural sciences especially medicine. In medicine he saw the remedy of the deliverance from diseases and sufferings. He read a great number of different medical books and collections, prepared from them short descriptions of remedies for treatment of illnesses and added new facts which he discovered as a consequence of his personal practice.

The book consists of three articles (*maqāla*) :

(i) About the diseases from head to foot, there are 120 chapters in it (sheets 1b-109b);

(ii) About external diseases there are 42 chapters (sheets 109b-128b);

(iii) About fevers there are 27 chapters (sheets 128b-144a);

These are followed by the parts concerning the regimen of convalescence (148a-150b), crisis of illness (sheets 144b-148a) and pulse (sheets 150b-151b).

After the laconic description of an illness, al-Qumrī indicated the remedies of its treatment including a prescription for the complex necessary medicine for illness.[21] Al-Qumrī exactly enumerated all the sources used by him. Not only has he acquainted us with the medical literature of Ibn Sīnā's epoch but also provided an opportunity to ascertain the names of authors to whom belong the ideas concerning the definition and the treatment for illnesses.[22] On the whole, he cites over 30 authors from Hippocrates (459-355 B.C.) to Abū Bakr al-Rāzī (865-925 A.D.).

Another peculiarity of the *Kitab al-ghinī' wa-l-Manā'* is that is was probably intended only for practical aims, because the chapters dedicated to such general theoretical questions of medicine as the structure of organs, causes of diseases and their manifestation, study on four juices and nature (*misadi*), common rules of treatment and maintenance of health and so on, are absent in this work. Such important medical problem at that time as investigation of pulse was touched upon in the work casually and superficially. In the beginning of the chapter, he wrote as follows : "The cognition of the pulse's essence and comprehending its qualities is very muddled science. (*ilm ramid*), which can be understood only the great efforts. There are many doctors, who are engaged in medicine during the last fifty or more years, but still they cannot recognise the essence of pulse because of lts muddle and diverse character."[23]

Ibn Sīnā paid great attention to pulse as one of the important methods of diagnosis. In his *Canon*, there is a special part dealing with pulse, in which he has elaborated in detail, all aspects of this problem.[24] Moreover, in explaining the details of this problem he used a theory of music.

Al-Qumrī's second work has also another name *Kitāb al-tanvīr al-ma'rūf bi-sirādj al-Qumrī*[25] (The Book of Elucidation that is known under a name of "al-Qumrī's Luminary").

There is a photocopy of an Istanbul manuscript of Aḥmad III library (no 2040). There is also a microfilm of the manuscript in the Cairo Institute of Arabic manuscripts.[26]

In the Introduction to this work, al-Qumrī writes, because of the advantage and the necessity of medicine for everyone at all times and places, he decided to help the beginners to study this science quickly and easily, for this purpose he collected from different books the terms, and explained them without indication the causes of their formation. He also writes that anyone engaged in medicine was acquainted with these terms, but it was very difficult for one inexperienced in medicine to understand them. He categorised all the words in accordance with the themes of ten chapters.

There are over 350 terms in this book. Moreover, the author took all the explanations of terms from his aforesaid great book *Kitāb al-ghinā' wa-l-manā'*, maintaining even the same order of arrangement of words as found in that work (especially in first three chapters of the dictionary).

In spite of the popular interpretation of many terms, al-Qumrī's dictionary is, on the whole of great importance for studying the medical terminology of Ibn Sīnā's epoch. The interpretation especially of different drinks, foods and some instruments which were used in medical practice at that time, are very interesting. Neither an ordinary dictionary nor the *Canon* and other works do give any interpretation of these words.

The other contemporary of Ibn Sīnā was Abū Sahl al-Masīḥī. He was born at Gurgān, lived and worked at K͟hwarazm at the time of al-Bīrūnī, Ibn Sīnā, Abu-l-Hair, Ibn Irāq and other. Masīḥī was a great doctor, astronomer, philosopher and naturalist. He wrote a number of works on astronomy mathematics and climatology. In the history of science, Masīhī was more famous as a doctor. He was Ibn Sīnā's close friend and one of his medical teachers.[27] He died at the age of forty[28] when he, with Ibn Sina, moved from K͟hwarazm to K͟hurāsān in 1010 A. D.[29]

Masīhī's eight medical works have been preserved. One of them is of encyclopaedic character, the other is on some medical questions like the human

physiology, general therapeutics, smallpox, plague, *misadi* and pulse.[30]

Masihi's main and the greatest work is *Kutub al-mi'a fi-l-sanā' at al-Jibbiya* (The Hundred Books on Medicinal Skill). A great number of manuscripts of this book has reached us, including two incomplete manuscripts : one is in Leningrad (N 56, there are 1-45 books in it) and the other manuscript is in Tashkent (N 5708). It contains 36 books (here 'book' means chapter), 1-29 describe general problems of medical theory; 30-33 deal with questions of simple drugs; 34-38 also deal some general questions (the causes and symptoms of diseases); 39-62, on fevers tumours and pulse; 63-94, on human diseases from head to foot and 95-100 on skin-diseases, luxations and poisons.

In the mediaeval centuries, Masihi's work was valued very high for its profoundity, clear exposition, laconicism and absence of repetitions.[31] Árudī Samarqandī even recommended it side by side with the works of Galen, Rāzī and Ibn Sīnā.[32] Even so, this remarkable Central Asian medical work has not been published and is out of sight of contemporary historians of medicine.[33]

Finally, among the other Central Asian doctors of that time we ought to mention Abū-l-Hair ibn al-Hammar. He was born in 942 A. D.[34] in Baghdad where, under Farabi's pupil, Yanyi ibn Adu's (d. 363/973) guidance, he learned philosophy and logic. He studied also medicine, especially its theoretical problems and he was called by his contemporaries the second Hippocrates. Then he moved to Khwarazm and in the palace of Khorezm-Shah Abu-l-Abbas Má'muna Ibn Mámuna (1009-1027), he worked with Ibn Sīnā, al-Bīrūnī, Masīḥī and others. Later he moved to Ghaznī with al-Bīrūnī and entered the service of Sultān Maḥmūd (998-1030). He died there in about 1030 A. D.[35]

Ibn al-Hammar knew Syriac very well and made a great number of translations from Syriac into Arabic. In particular, he translated the work of Byzantine doctor, Aeziyi Amidian (502-575).[36] He wrote several works on medicine and philosophy.

In his medical works, he described such questions as human anatomy, regimen for oldage, nourishing substances, epilepsy and training of doctors.

In his *Pharmacognosy*, al-Bīrūnī quoted two works of Ibn al-Hammar', namely, *al-Ḥāshiya 'alā matn bulis* (The Commentary on Pavel's text) and *Kitāb al-aghziya* (a book about food). In the first, Greek and Syriac names of medicinal remedies were used, but the author seldom indicated their native names.[37]

In olden days a particularly great attention was paid to the order of giving materials relating to different domains of medicine, because it had a great significance for the successful familiarization of the enormous material.

In the sixth century A. D., the Alexandrian scientists (according to incomplete information, there were more than seven scientists) selected 16 out of the innumerable works of Galen, and arranged them in a definite order. Afterwards, these books were translated into Arabic under the common name *Sitta 'ashara* (16 books) or *Jami'al-iskandaranyiin* (The Alexandrian Collection)[38] and were widely spread in the Orient.

Abū-l-Hayir ibn al-Hammar also worked on the order of materials. In the first place he observed that not all the necessary books were included in the "Collection" on food, drugs and air were absent and in the second place, the order of the arrangement of materials did not correspond to that of Galen.

In Ibn Sīnā's *Canon*, we notice the same picture. In spite of Abū-l-Hayir's opinion, Ibn Sīnā, while arranging the first theoretical chapters of the first book of *Canon*, adhered to the order of the Alexandrian collection. And if we compare the arrangement of materials in some divisions of medicine in the works of other doctors of Ibn Sīnā's epoch as well as of some of his predecessors, with the structure of the *Canon*, we can find rather a curious picture.

It turns out that, in the works of the Bukhāran doctors, Ahavayini and al-Qumrī, the main part of practical medicine describing the remedies for the so called private diseases from head to foot, was placed earlier than the division of the so-called general diseases; while in the works of Rāzī, Majūsī and even Masīḥī, the order was quite the opposite. Ibn Sīnā followed the tradition of the Bukhāran scientists, described in the third book of *Canon*, private diseases and, in the fourth, general diseases.

The foregoing leads us to conclude that in Ibn Sīnā's epoch, the great doctors who wrote classical medical works, lived and worked in Central Asia, in particular at Bukhārā, Samarqand and Khwarazm. But none of these works can be campared with the *Canon* in relation to the scope and breadth of materials, profoundity and succession of exposition. Nevertheless, the works of these doctors, Ibn Sīnā's teachers and contemporaries were a source for the creation of the *Canon*.

Notes and References

1. Abū Bakr al-Ahavaynī al-Bukhārī : *Hidāyat at-muta* allimīn fīt-t-ṭibb, Mashhad. 1344, 918 pp.
2. *Abū Ālī ibn Sina tarjimai holi*, Tashkent, 1980, 8-bet.
3. *Ibn Abū Usaibi' a* : *'Uvūn al-anbā' fī tabagāt il-aṭibbā'* *Misr*, 1882, vol. II, p. 2-3 (later Ibn Abu Usaibi'a).
4. *Abū Raihān Bīrūnī* : *Pharmacognosy in Medicine, The Selected Work*, translation and comments by Karimov U. I., Tashkent, 1973, pp. 67, 139.

5. ıoid., P. 140.
6. Probably the works of the Andalusiyan scientists at the time of al-Bīrūnī and Ibn Sīnā were not yet spread in the Caliphate's eastern districts. This explains the absence of references to them in *Canon* and *Pharmacognosy.*
7. Al-Bīrūnī : *Pharmacognosy.*
8. Ibn Abū Usaybi'a 1, 240.
9. *Zabih alla Safa, Tarih-i-'ulūm-i 'aklī dar tamaddun-i islāmī*, 1, 1336, pp. 204-205.
10. Karimov U. I : O *Medicinskom nasledii Ibn Siny, sbornike : Abū Ālī ibn Sīnā*, k 1000-letiyu so dnya rojdeniya. Tashkent, 1980, p. 133, No. 19.
11. Fuat Sergin : *Geschichte des Arabischen Schriftumms*, Band III, Leiden, 1970, S. 315.
12. Mahmoud M, Sadek : *Notes on the Introduction and Colofon of the Leiden manuscript of Dioscorides*! "De Materia Medica," *Intn. Jour of Mid. East. Studies*, v. 10, N 3, 1979 p. 345-364.
13. Bartold W. W. *Sochineniya*, VII, VII, 1971, p. 477.
14. Mahmoud . . . , pp. 352, 354.
15. Ibn Abu Usaibi'a, 1, 327.
16. *Nāma-i-dānishwarān-i Nasirī*, 1, Tehrān, 1296, p. 380 (later, *Nāma-i dāiṣhwar ān*)
17. Ibn Abū Usaybi'a, in the same work.
18. Fuat Sergin———111, 319.
19. Some authors consider them as contemporaries motivated by the fact, that Qumrī, in his work, very often quoted al-Rāzī and the latter in Al-*Hāwī* referred to Abū Manṣūr's '*Ilal al-Ilad* (The cauees of diseases"). *Nāma-i dānishwarān*, 1, 381; Maḥmūd Nadjmābādī : Tarih-i ṭibb dar Irān pas as Islām, Tehrān, 1353, p. 654. We consider it being unlike, because Qumrī died almost in 75 years after al-Rāzī's death and when the latter was writing his work *Al-Hāwī*, Qumrī hardly was prominent as author of this work.
20. Fuat Sergin, III, 319.
21. At the end of the book al-Qumrī made a special mention that he did not include in it a part about the compound drugs, because they could be found everywhere.
22. Ibn Sīnā in his work *Canon* also mentioned both the earlier scientists as well as his contemporaries, though sparsely. That is why it is difficult to decide when he quoted the other authors and when he descibed his personal observations. for example : the historians of medicine specially emphasized the fact that Ibn Sīnā in his *Canon* [Book I, p. 236, Book III (2), p. 86] wrote about the distinction of different kinds of dropsy with the help of percussion. But, meanwhile, in all diagnostic text books, the priority in the application of percussion is attributed to Vienna's doctor L. Auenbrugger, who offered to use percussion in 1761. (Petrov B. D. *Ibn Sīnā tvorets Canona, vrachebnoy nauki*, I, p. XXXVI; 467, pr. k str. 238; Djumayev V. K. *Hirurgi Abū Ālī ibn Siny iyeyo istoricheskive istoki*, Tashkent, 1965, p. 161. al-Qumrī (MS of the Institure of Oriental Studies sh. 74b) and his contemporary 'Alī ibn 'Abbās al-Madjūsī (d. 994; *Kāmil as-Ṣana's* a, 1, p. 374) wrote about the same method with definition of different kinds of dropsy.
23. Ms of the Institute of Oriental Studies, Academy of Sciences of UzSSR, sheets 150.b.
24. *Canon*, 1, pp. 240-262.
25. Fuat Sergin, III, p. 319.

26. *Fahris al-makhtutat al-muṣawara, al-juz' aṣ-ṣālis, al-gism aṣ-ṣānī*, 1959, p 57, N 69,
27. Ibn Abū Usaibi'a, 1, 328.
28. *ibid.*
29. Fuat Sergin, III 326, *Nāma-i-dānishvarān*, 1, 36
30. Fuat Sergin, III, 326-327.
31. Ibn Abū Usaibi'a 1, 328.
32. Nizāmī 'Arūdi Samarqandī : *The Collection of Rarities or Four Conversations*, M., 1963, p. 106.
33. Fuat Sergin, III, 326.
34. Ibn Abū Usaibi'a, 1, 322.
35. Sabihalla Sapha : The cited work, p. 84, According to some information he lived more than 100 years.
36. Al-Bīrūnī : *Mineralogiya*, Perevod A, M. Belenitskogo, M., 1963, p. 88.
37. Al-Bīrūnī, *Pharmacognosy*, p. 103.
38. In Latin, the name of the Collection was *Samaria Alexandrinorum*.

GENERAL PRINCIPLES FOR THE TREATMENT OF CARDIAC DISEASES IN THE QĀNŪN OF IBN SĪNĀ

M. S. KHAN

In the scientific exchanges between India and Central Asia in the mediaeval period, those concerning medicine occupy a significant position. Of the medical authorities of the time, Ibn Sina holds an honoured place. The *al-Qānūn fi'ṭ Ṭibb* of Ibn Sīnā (980-1037 A.D.)[1] is an encyclopedia of medical science whose Latin translation was the text book in the medical faculties of European Universities till the 17th century. Considerable praise has been bestowed on this work and except the *Al-Ḥāwi*[2] of Abū Bakr Md. bin Zakarīyah ar-Rāzī such a comprehensive work covering all aspects of medical science did not exist in any language of the then world. Ibn Sīnā describes in it all the known diseases according to the anatomical parts which they affect, starting from the head and finishing with the foot. It also contains a thorough discussion of the different kinds of cardiac diseases, their causes, effects and treatment. Ibn Sīnā is also the author of a special treatise dealing with drugs for the treatment of cardiac diseases.[3]

In the *Qānūn* and the *Risāla,* Ibn Sīnā discusses the following diseases of the heart.

1. *Sū'-i Mizāj* (ailments concerning the abnormalities of temperament).
2. *Awrām al-Qalb* (Inflammation of the heart).
3. *Khatagān* (Palpitation of the heart) which is of two kinds : (a) hot and (b) cold.
4. *Ghashi* (fainting fits and collapse.
5. *Sugūt al-Qūwwah Baghtatan or Daf'atan* (Sudden loss of strength or sudden heart failure).

The section on cardiac diseases is divided into two discourses or *Maqālās.* They are sub-divided into seven and five lucid and orderly chapters (*Faṣls*) respectively. In all they cover eighteen long closely printed pages of the Cairo edition of 1294/1877. The first discourse contained a chapter entitled, *Faṣlun fi Qawānīn al-Kulliyah fi 'Ilāj al-Qalb* or *General Principles for the Ṭreatment of Heart Diseases,* which is printed on about three pages. It is proposed to present a brief study of this chapter in this paper, in order to bring out his scientific method as a physician and study his views concerning the treatment of heart diseases. First of all an English translation is given below :

"We have (written) a separate treatise on cardiac drugs. Any one can

benefit by its study if his knowledge of the science of medicine is supplemented with the knowledge of other natural sciences which are more general than medicine itself.[4] But here (in this chapter p. 266) we will refer only to those matters (relating to the treatment of heart diseases) which are discussed in general books of therapeutics.

As the heart is the most important and the noblest of all the vital organs of the body, it is necessary that the physician should proceed carefully in treating and (selecting) the (correct) medicine with a firm and clear understanding whether the object of the therapy is to cleanse and purify any humour (from the heart) or to change its temperament. As for evacuation (of toxic matter) which may be a substitute for venesection, such action should be taken so that it is not necessary to take any other action, in order to avoid its bad effects. Such method has to be adopted so that too much blood is not let out resulting in the loss of the strength of the heart. If some strength is lost, it is invigorated with suitable drugs.[5] Such a precaution is necessary if the strength (of the heart) is lost due to hot or cold temperament. This action is taken not only after venesection but also after all other methods of the evacuation (of toxic matter) although it is most desirable after venesection. The cause why venesection dispenses with other methods of treatment of heart diseases is that the evacuation of blood is not like applying medicine to the heart. The early stage of congestive heart diseases (inflammation) is caused either by blood congestion or by fever (vapours) and blood-letting by puncture of veins saves the patient from the evil effects of both. If the heart is afflicted wlth the congestion of blood, the right basilic vein and in the case of heart affected by vapours the left one[6] should be puctured (bled). But the evacuation of all other matters should be affected by drugs and it is necessary to take the above action along with other precautions, because all these drugs for evacuation are contra to the body of the heart. Therefore, it is necessary that some cardiac drugs are added to them which posses the special characteristic of keeping up the strength of the heart. It is necessary that the drugs for the evacuation of cardiac humur (toxic matter) should be combined with specific antidotes which protect the heart and are useful (lit. suitable) for it. The mixture of all these drugs is very useful but most of them are so useful for another reason. It is this, that the antidote enables the drugs used for evacuation in reaching the heart also by itself and obstructs their penetration into organs of the body other than the heart".

As regards the treatment for change of temperament it can be the change of four temperaments only : cold, hot, moist and dry.[7] If we intend to change the cold temperament, we will prescribe hot medicine mixed with heat generating cardiac drugs, with this caution that there should not occur, as a result of them, any violent movement of any humour in the heart. We have to take precaution so that the tissues of the heart do not dilate due to the increase of flatus (vapour)

or other toxic matter which causes (its) inflammation. If we want to change the hot temperament, we will not restrict ourselves to cold-tempered drugs only because the heart is by its substance (essence) related to the animal spirit.[8] The animal spirit is actually of hot (temperament) but its natural (internal) heat is not so high as to cause injury to the body of the heart. If this spirit is heated due to abnormality in temperament of the heart, it diminishes, dissolves and becomes decomposed and dull. The spirit which is the root will be dissolved if something reaches the tissues (lit. body) of the heart which extinguishes its natural heat if it has not been combined with such heat-generating drugs which possess the characteristic of increasing (stimulating) the internal heat and this is not due to this heat but on account of the character of the temperament which accompanies that heat. If they benefit the branch, which is the tissues of the heart and moderate its heat, it would extinguish the heat of the animal spirit. For this reason, they (the former physicians)[9] used to combine cardiac drugs of abnormal hot temperament with the medicines of cold temperament for correcting the abnormality of heart's hot temperament. What led them to this mixture of cold drugs with hot heart drugs was their belief that if the constitution (of the body) is strong, it would distinguish between cold-tempered and heat generating drugs, and carry the cold-tempered drugs to the heart and heat-generating drugs to the animal spirit. The cold-tempered drugs will moderate the heat (of the heart). If they (the former physicians) found any moderate or near-moderate drug which could particularly strengthen the animal spirit like *Lisān al-Thaur* (bugloss), they prescribed it too frequently. If the constitution of the patient is weak, then no treatment will be effective. Sometimes, they need to give the patient heat-generating cardiac drugs because they know that most of the cold-tempered cardiac drugs were hard substances (*thagl al-Jawāhir*) which are less absorbable and their natural characteristic is durability, and not absorption. For this purpose, they need to combine the heat-generating absorbable cardiac drugs with it so that they may help the constitution in absorbing it (hard substance) into the heart. For example, they combine suffron (*crocus sativus*) with pinches (p. 267) of camphor (*camphora ofticinarum*) for this purpose because camphor also reaches the heart along with saffron. Then it depends on the strength of the constitution, whether it can hinder it (saffron) from reaching the heart and direct it (saffron) to reach the animal spirit and assist in balancing the temperament of the heart with the help of cold-tempered drugs. Verily, this heat-generating drug is more useful than the use of cold-tempered drugs exclusively which stop on the way and are not absorbed. Those who dropped saffron[10] from the pinches of camphor as if they were rectifying an error of their predecessors—do not understand that by this (action of theirs), the effect of camphor is reduced considerably. The hot temperament of the heart is treated with giving the patient concentrated fruit juices to drink specially of Syrian apples (*pyrus malus*) and quince, because they are useful as drugs. We will mention hereafter other drugs of this kind which (are prescribed) with heat reducing pastes and pigments mixed with tonics which strengthen the heart. If

this imbalance is caused by some other matter, it has to be evacuated. Regarding imbalance in the cold temperament it is treated with major electuaries (confections) which we will describe hereafter or with *Sharāb-e-Raiḥānī* (*moderate wine*) and light exercise with local pastes and pigment of hot temperament and sweet scenting drugs applied to the heart. Diet of hot temperament foods, as much as the patient can digest, is recommended. If it is caused by any toxic matter, it is necessary to evacuate it".

For the treatment of the abnormality in the dry temperament rich juicy diet is prescribed (which may create moisture). Bath is recommended after meal in a particular kind of bathing vessel. The patient should not move much and take to rest and recreation[11] and drink cold water in large quantity. But if there are indications of cold (dryness), the patient should refrain from very cold water and achieve the balance in temperament with help of diet and drinks and long sound sleep after hot food. If dryness is caused by hot temperament (toxic matter) it has to be evacuated. We will discuss this in detail when we discuss hectic fever and dryness.[12]

The moist temperament is to be treated with light diet and the use of drugs which cause dryness, light exercise and frequent bath with hot water before meals. The body has to be kept wet with hot water combined with the use of purgatives and purgatives and diuretics and strong wine and less sweet-smelling drugs are given such as the chyme (juice) of moderate (quality) but not too much (in quantity) If the patient has temperature, he should refrain from a bath and sexual intercourse. It the toxic matter is moist or hot, it should be evacuated".

The Cardiac Drugs

"As regards the complete list of drugs used for heart diseases, it would be found in the books of simple drugs specially in the table of drugs for respiratory organs.[13] But for the sake of necessity we would mention now such drugs only which are basic and fundamental among them for cardiac diseases.

Among the more or less moderate or balanced temperament drugs there are: Yāqūt (ruby), Sanjazag, Fīrūzā (turquoise), Dhahab (gold), Fiḍḍa (silver) and Lisān ath-Thawr (bugloss). Of the drugs of hot temperament there are Darūnaj or dronicum, Jadwar (zedoary); Misk (musk): Ámber (anbergris); Zarnabād (long zedoary); Abresham (silk cocoon), Zāfrān (saffron); Bahmanān[14] (behman or the root of a red and white plant resembling a large reddish) which is quick in action; Qaranfal (clove, wonderful drug); Ùd al-Khām (green aloewood); Badranjbōya (balm mint) and its seeds; Badnrūj (Sweet basil) and its seed; Shāhsiparam (sweet basil) and its seed; Qāqla (greater cardamom); Kabāba (cubeb); Firinjmushk (basil) and its seed; Waraq Utrūjj[15] (citron); Ḥummādah (cold sorrel or the juice of an orange), Sājiz al-Hindī (indian spikenard) and Rasan (junipar, a wonderful drug)".

Regarding drugs of cold temperament we recommend Lū'lū (pearl), al-Kahrubā (yellow amber), Bussād (coral); Kāfūr (camphor); Sandal (sandal wood) al-Ward (rose), al-Tabāshīr (bamboo manna); at-Tīn al-Maktūm (wax); al-Tuffāḥ (apples); Kūzbarah al-Yabīsa (dry coriander) and Khūzbarah ar-Raṭbah (fresh coriander) and others".

Substances of this Section

The section on cardiac diseases first describes the physiology and the anatomy of the heart and its proper location. Then Ibn Sīnā explains the eight different ways by which the condition of the heart can be diagonised.[16] He interprets clearly how the affliction caused to the other organs of the body affected the condition of the heart.

Ibn Sīnā has discussed the causes, the effects, the symptoms and the treatment of five cardiac diseases as stated above.[17] He explains the three general and broad causes of cardiac diseases. First, *sudūd* or anything which obstructs the smooth circulation of blood (fluid collection); secoddly, temperamental imbalances (*sū-mizāj*) and thirdly the weakness of the heart itself (*ḍu'f qalb*).

The damaging effect of these diseases is the loss of heart's vital energy to sudden heart failure and death. Ibn Sīnā has discussed these effects in great detail in this section of the *Qānūn*.[18]

The number and variety of simple and compound medicines prescribed for the treatment of heart diseases gives the impression that Ibn Sīnā considered them curable yet he emphasizes that they may lead of death or sudden death. He states that when there is an acute abnormality in the temperament of the heart, it cannot be treated successfully and that heart diseases do not easily admit of treatment.

The last part of the first discourse contains general and simple drugs for the treatment of heart diseases as translated above.[19] In the second discourse sample drugs and four compound prescriptions (*muskha*) are recommended. For palpitation due to heat and for palpitation due to cold only four prescriptions of compound drugs have been recorded.[20] The different drugs are characterized as hot, cold or moderate.

The Special Risāla on Cardiac Diseases and Drugs

In the beginning of this chapter under study Ibn Sīnā mentions the special *Risāla* which he had written on cardiac drugs. His *Risāla fi'l-Adwiyat al-Qalbiyyah*[21] is available in as many as three printed texts—one incomplete and two complete ones. The full edition of this text was published with a Turkish translation at Istanbul in 1937.[22] It is medico-philosophical in character and any one who makes a comparative study of this section of the *Qānūn* under study and the

Risāla cannot fall to realise that the former is a medical treatise written by doctor of medicine while the latter gives the impression of a treatise on medicine compiled by a philosopher showing a close relationship between medicine and psychology. Hakeem Abdul Lateef has rightly observed in his introduction to the Urdu translation of *al-adwiyat al-Qalbīa* that this tract of Ibn Sīnā is based on his personal researches, and he is the first physician to have established the link of psychology with that of medicine. He has held the heart as the source of spiritual disease involving good and evil, joy and grief, love and hatred, ill-will and enmity, hatred and jealousy, anger and cunning, etc. These, accoording to him, are caused by the structure of the heart and its fluids and humours which can be rectified only by an expert physician.[23]

Ibn Sīnā clearly understood the fatal nature of heart disease one thousand years ago as is done by the physicians of modern times. For this reason he took special care to write a separate *Risāla* on drugs for treatment of cardiac diseases. The physicians all over the world now pay much attention to heart diseases since they are the highest killer of human beings aged above forty sometimes even more fatal than cancer.

Brief Commentary

Ibn Sīnā begins the *Qānūn* with the *Kullīyāt Ṭibb*[24] in which he lays down and explains the general principles of medicine, health, hygiene and prevention of diseases. Similarly he discusses the basic principles concerning the treatment of heart diseases in this chapter. It opens with an important remark which implies that a physician will be benefited by its study if he possesses knowledge of the physical sciences as medicine is a branch of physics. Physics discusses matter in general whereas medicine deals with human body alone.[25] He rightly considers the heart as the most important organ of the human body and advises the physicians to take the utmost care in the treatment of cardiac diseases. The general principles explained here are related to four kinds of temperament based on the four humours as expounded by Galen. Equilibrium of the humours means equilibrium of the temperament. By stressing and emphasizing the correction of the abnormality of the temperament of the heart, Ibn Sīnā actually suggests that bad humour has to be changed into good humour. His main recommendations are for restoring temperamental and humoural balance (normal condition) of the heart. The balance between the humours assures the health of the heart as well as of the body. According to him the body temperature and the temperature of the heart must be kept constant. Moreover, the animal heat of the heart must also be controlled.

Ibn Sīnā argues that all the drugs prescribed for the treatment of cardiac diseases should agree with the temperament of the patient. He warns that all drugs which do not agree with the temperament of the heart may ultimately cause

some disorder or otherwise cause harm to the patient. In recommending treatment in general Ibn Sīnā advises that the *Mizāj* (temperament) and the *Tabiâ* (constitution) of the patient are to be taken into consideration. Special care should be taken to assure that the drug is not injurious to the heart. Evacuation of the humour may be done but venesection should be taken recourse to as the last resort. He makes an important general statement that any drug which can strengthen and stimulate the heart and its animal spirit is good for cardiac diseases.

Conclusion

The general principles discussed above show that Ibn Sīnā was an acute observer and a careful medical practitioner. He has made it clear that he discussed the heart diseases from a medical point of view in this section on the *Qānūn*. This discussion is philosophical and psychological in the special *Risāla* on cardiac drugs. There is nothing supernatural or superstitious about his approach to the subject which is free from theological and metaphysical bias. The general principles are based on clinical observation, experiment and reason. The scientific method applied is analytical induction by which he derived the general principles. He also follows the method of logical deduction in applying these principles to particular patients.

The after effect of the treatment and the drugs used have also been explained and these clinical observations seem to be based on his personal research and experience as a physician. He takes into consideration previous theories and researches concerning heart diseases but he does not spare criticizing his predecessors where he thought they had committed errors.

The most important consideration for the treatment is the humoural and temperamental balance of the human body as well as of the heart. It is the ancient Greek concept discarded by modern doctors of medicine. In this chapter and in this section as a whole, Ibn Sīnā prescribes natural drugs for the treatment of heart diseases and especially lays stress on the kind of food and drink (diet) to be given to the patient. But this chapter or this whole section cannot be judged from the point of view of the advanced and scientific knowledge of heart diseases and their treatment that we possess in modern times. It has to be pointed out that the *Qānūn* was written in the early eleventh century. Medical research today has the advantage of highly sophisticated apparatuses and instruments being the result of developed technology which were not available to Ibn Sīnā one thousand years ago.[26] For this reason, tremendous progress has been made in the treatment of cardiac diseases during the last three decades. Physicians of modern times will also emphasize the fatal character of cardiac diseases as has been done by Ibn Sīnā, both in the *Qānūn* as well as in the *Risāla*. It is true that like the modern physicians Ibn Sīnā had no definite idea of such cardiac diseases as hypertension, hyperthyraidism, arterioselerosis, arthritis, congenitel defect,

coronary thrombosis and others which are the leading causes of death for aged people particularly belonging to developed countries. Considering this section of the *Qānūn* as a whole it may be stated that modern clinicians may study Ibn Sīnā's heart therapy and may use it with good results. In a growing and developing science like medicine it is not desirable to overlook the work done by the physicians of the middle ages. The knowledge of the past can certainly be useful for the "conquest" of heart diseases in future.

The following opinion expressed about al-Bīrūnī, (d. 442/1050) a contemporary of Ibn Sīnā. applies equally to the latter as regards his scientific method:

"His firm belief in the laws of nature, his insistence of continuous observations and collection of reliable data mark him out as one of the greatest exponents of the true scientific method".[27]

Notes and References

1. His autobiography and biography have been studied by william F. Gohlman, *The Life of Ibn Sīnā.* A critical edition and annotated translation (Albany : State University of New York, 1974) pp. 163. Parts of the *Qānūn* have been translated into English by O. Cameron. Gruner (London, 1930, pp 612) and Mazhar A. Shah (Karachi), see below.
2. Twenty-five volumes of the *al-Hāwī fi'ṭ Tibb* have been published by the Da'irat al-Ma'arit il-'Osmania, Hyderabad. In the medical school of Louvain it was studied as a text book in the 18th century.
3. Text edition (Cairo : 'Āmurah press, 1294/1877), vol. II, pp. 265-267.
4. Ibn Sīnā here is referring to *'Ulum Tab'iyah* which means all sciences connected with physics.
5. The word actually used by Ibn Sīnā is *ashyā'* or "things".
6. This is the *bāslīq* used by writers on Greco-Arab medicine.
7, At another place Ibn Sīnā also postulates the combinations of these i, e, hot-moist, cold-dry; hot-dry and so on. According to Galen there are four kinds of temperaments atrabilious, phlegmatic, bilious and sanguine.
8. There are three kinds of the pneuma which are explained by Ibn Sīnā in the *Kulliyāt* : *ar-Ruh at-Tabi'i* or natural pneuma (spirit) in the liver; *ar-Ruh al-Hayawāni*, the naimal pneuma in the heart and the *ar-Ruh an-Nafsāni* or psychical pneuma in the brain. This is actually a Galenic concept.
9. He actually means ancient learned men *'Ulamā'al-Mutagaddimīn* or *Atibbā' Sābigin* or former physicians.
10. *Za'fran* Saffron's usefulness as a drug for heart ailments has been explained in the *Risāla* by Ibn Sīnā (Arabic text Istanbul ed. p. 36).
11. Reading *Tarfiyah* as in the Lucknow ed. Vol. II, p. 215.
12. See Book IV of the *Qānūn*. Cairo ed. Vol. III, pp. 1 ff.
13. Table VIII of the *Qānūn*. It has a section on drugs which strengthen the heart, Cairo ed. Vol. 1, p. 241.

14. Bahman (behman) is of two kinds red and white—the red is hotter. See *Greco-Arab Concepts on Cardio-Vascular Diseases* edited by Hakim Mohammad Said (Karachi, Hamdard, 1983) p. 49.
15. Or *citrus medica*—a vegetative drug. Ibn Sīnā has explained its characteristics in the *Mufradāt*.
16. *Al-Qānūn*, Vol. II, pp. 263-64; See Hakim Mohammad Said, *op. cit.* p. 41.
17. See *al-Qānūn* ed. cited Vol. II, p. 262. For symptoms see *Ibid*, p. 264. The most detailed treatment is that of the *Khatagān* see *op. cit*, Vol. II, pp. 267-272. *Awrām* see Vol. II p. 265.
18. *Al-Qānūn*, Vol. II pp. 272 ff. For sudden heart failure see Vol. II, pp. 278-79.
19. *Ibid*, Vol. II, p. 267.
20. *Ibid*, Vol. II, pp. 271-72.
21. See Khan, M. S. "Ibn Sīnā's Treatise on Cardiac Drugs" paper delivered at the Symposium in Commemoration of the 1000th Anniversary Ibn Sīnā held at Kuala Lampur, Malayasia, 29th June to 1st July, 1981. See his "Ibn Sīnā's Treatise on Drugs for the Treatment of Cardiac Diseases "in the *Islamic Quarterly*, XXVII/(London, 1403/1983) pp. 49-56. See Hakīm 'Abdul Latif "Introduction to 'Heart Drugs' a Brilliant work of Researeh by Avicena" in the *Avicenna Commemoration Volume* (Calcutta, 1956) pp. 245-254.
22. Published by the *Turk Tarikh Kūrūmu* (Istanbul, 1937). Edited and translated by Kilisli Rif'at Bilge. Arabic text pp. 55. Turkish trans pp. 64. Translated into Urdu by Hakīm 'Abdul Latif and published by Iran Society of Calcutta in 1956. For an English translation of this tract by Hakeem Abdul Hamıd see *Avicenna's Tract on Cardiac Drugs and Essays on Arab Cardiotheraphy* (Karacci, Institute of Health and Tibbi (Medical, 1983) pp. 216 at pp. 11-16.
23. Quoted in the Preface of Hakeem Abdul Hamid's above book.
24. Cairo ed. Vol. 1, pp. 1 ff. See the English translation by Mazhar H. Shah, *The General Principles of Avicenna's Cannon of Medicine* (Karachi, Naved Clinic, 1966) pp. 459.
25. See note 4 above.
26. See Khan, M. S. "The Section on Cardiac Diseases and Their Treatment in the Qānūn of Ibn Sīnā" a paper presented at the Ibn Sīnā Millenary Celebrations held on 2-5 November, 1981 at New Delhi.
27. Baranī, S. H. "Al-Bīrūnī and His Magnum Opus *al-Qānūn al-Masudī*, Eng. Intr to the Arabic Text, p. Ixxi. Published by the *Dāirat al-Maārif*, Hyderabad, Vol. I. (1373/1954) pp. 505.

PROBLEMS OF DIETOLOGY, GASTROENTEROLOGY AND HEPATOLOGY IN IBN SINA'S CANON OF MEDICINE

H. N. MANSUROV

The *Kitāb al-Qānūn fi-l Tibb* or the *Canon of Medicine* of Ibn Sīnā or Avicenna with its glorious history and its significance and content is one of the greatest classics of culture (V. N. Ternovsky). It is difficult to name any other encyclopaedic work which had been used for centuries by physicians of the whole European continent—a work which had been so many times reprinted and translated in so many languages and which, for over a thousand years, has remained an inexhaustible source of wisdom.

The most striking fact is that, even today, by reading this classical work, any clinician will find in it the "Canons" (rules) which remain perfectly valid. Sometimes they are given in such detail that they can be accepted without being changed or amended. According to B. D. Petrov, in mediaeval Europe there was no one who could be compared with the author of the *Canon* in respect of the extent of knowledge, talent and enormous creative achievement. A great person of Renaissance, Michel Angelo, said that it would be better to be wrong, following Galen and Avicenna, that to be right, following others.

Some problems of diagnosis, clinical course and dietology outlined in *Canon* are examined in this paper from the viewpoint of modern medicine, particularly of gastroenterology, represented by the author. We would like to point that the origins of our science are not always correctly reflected in the literature. For instance, in a very useful book on the management of constipation[1], published recently in Great Britain, many points of aetiology, mechanism of development and dietary treatment of constipation are in accordance with those in the *Canon*; however, the authors of the book never cite Avicenna.

Guides to Diagnosis

Many subjective and objective symptoms, as well as other signs (keys), including some syndromes of which our great predecessor speaks in his *Canon*, have not lost their diagnositical value even in our days.

Enumerating ten signs of the state of the patient's nature, Avicenna speaks in detail of palpitation, inspection of finger nails (convex fingernails are frequently observed in tuberculous patients), hair (rapaid growth, abundance or scarcity, thinness of thickness, smoothness or curliness), colour of the skin and of the visible mucosa (whiteness indicates a deficiency of blood). He correlated jaundice with hepatic lesions, but admitted that it might develop in the case of

blood dificiency even. The *Canon* mentions a third variety of jaundice, viz., "the skin of the face becomes dark owing to the great acerbity of bile".

Avicenna correlates the development of jaundice with changes in the urine colour: "In jaundice the urine is of a red colour, tending to blackness. Such type of urine discolours the cloth with a stain that does not disappear. If the urine of a patient is white or slightly reddish; while jaundice continues, one should expect ascites". Retention of urine in an icterous patient is a bad sign.

Among the important diagnostical signs (guides), Ibn Sīnā considered the state of mental faculties like sleep, wakefulness, dreams and the speed of response of the organs to a stimulus. In oder. to assess "the nature of the brain", he took into consideration the colour of the eyes. He could perform percussion of many parts of the body, including the abdominal cavity, where he distinguished the "wine-skin" type of ascites and "drum-like" one— a sign that indicated "winds".

A special place in the *Canon* is given to a consideration of signs of external and internal "tumors" in relation to the sensitivity of an organ or a tissue. Thus, "when hot tumors are formed in the nerves, the pain is very acute.......". They rapidly lead to "stupor and loss judgement as well as disorder of movements of flexion and extension. All tumors of visceral organs cause emaciation of mild parts of the abdomen".

The diagnostical signs described in the *Canon* belong to various fields of medicine—therapy, neurology, neurosurgery, psychiatry, pediatrics, surgery, dietology, balneology, otorhinology etc. : "when the accumulated matter turns into pus, the pain and the attacks of fever and pulsation subside, and instead of pain, there is a kind of itching. If there had been redness and firmness, the former disappears, and the part of the body, when pressed upon, feels mild and all painfull sensations subside, and the gravity of the tumor reaches its limit".

Of great interest are the signs of transition of the matter from an organ into another in the case of "internal tumors". Ibn Sīnā elaborates upon such transition as benign or as ominous, in the case of a transition from pleura into the region of heart. As signs of "transition of internal organs and pus upwards", he considered, among others, the difficulty in respiration. "If the tumor goes up and reaches the brain it is bad and dangerous, if it goes to the mild flesh behind the ears, there is hope for survival".

The limited volume of the present work does not allow us to discuss in detail "the Science of the Pulse", as the author of the *Canon* called' it. The pulse, according to Ibn Sīnā is the movement of vessels composed of contraction and dilation. The pulse should be examined when the patient is free from anger or joy, when he performs no physical exercise and feels no hunger or fullness. To those who wish to master the Science of the Pulse, Ibn Sīnā advised "to examine previou-

sly a normal man with perfect health". He recommended that everybody should know the frequency of their pulses to that, in case of disease, they could tell the physician what their normal pulse was. While examining the pulse, Ibn Sīnā paid attention to its fullness, regularity or lack of rhythm, frequency, tension etc. He described meticulously the varieties of pulse in men and women, in states of sleep and wakefulness, at various levels of age and in various seasons. He outlined the influence of quantity and quality of food upon the pulse as well as the effect of bathing, pregnancy, pain, emotions etc. We can conclude that, in the time of Galen or Ibn Sīnā, physicians. feeling the pulse of the patient, were able to get much more information than we do in our time. The abundance of instrumental methods of investigation of the cardio-vascular system in our time has led to a decrease of attention of physicians to the detailed study of pulse as expounded in the *Canon of Medicine*

Ibn Sīnā was well aware of the fact that the lesions of an organ are not limited by local pathology, since the disease" occurs sometimes in one organ, and sometimes in a combination of organs". He drew a distinction between a concomitant disease and possible complications. According to him "it should be considered which of the diseases had occurred earlier; then it will be possible to suppose that this was the main one, and the other was the concomitant one".

Further : "to find out which of them develops afterwards and subsides, when the first one has been eliminated." It is thus clear that, in the latter case, he meant complications of the main disease.

To assess correctly a disease, its nature, location of the lesion, disorder of a function, Ibn Sīnā attached great importation to the knowledge of anatomy and used the following roads of recognition of internal diseases : to consider qualitative and quantitative disorders of a function, on study the nature of excretions (urine, faeces, vomit, bile, sweat), to determine the location of pain, tumors and organs, and to determine the external manifestations of the disease. We can say, therefore, that the criteria used by Ibn Sīnā for diagnosis do not differ from those of today, namely anatomical determination of the pathological process; assessement of functinal disorders; presence of complications and concomitant diseases.

The concept of the point of least resistance (*locus minoris resistantiae*) is distinctly formulated in the *Canon* : "Sometimes one organ is weaker than the other, and the former is more subject to disease".

Ibn Sīnā studied the patient's excretions so meticulously that we can consider him as the founder of modern laboratory diagnosis. His rules of investigation of the urine are valid in our days : it is necessary to collect the first morning portion of urine in a clean vessel and not to expose it to the sun; the study of the urine should not be delayed for a long period. He thought that those who recommended the study of urine after six hours were wrong : He

regarded that examination of urine even after one hour was late enough, since the signs of the urine become weaker, its colour and deposit change. The great physician pointed out that, before the collection of urine, the patient should neither drink nor eat, especially saffron, pomegranate and cassia, after which the urine turns green, or bitter foods after which it turns black. "After normal food, the urine is white and remains white until the stomach begins digesting. The patient should not take in any substance that causes production of juices".

In the time of Ibn Sīnā, there existed neither modern methods of chemical analysis of the urine nor the microscopical study of its sediment. However, the detailed description of urine analysis, exposed in several paragraphs of the *Canon*, is worthy of admiration. Perhaps—and regretably—in modern nephrology and urology, the methods of investigation of urine described by Ibn Sīnā have not received due attention. "You should know that when you bring the urine nearer to your eyes, it looks more opaque, and when you study it from a certain distance, it looks more transparent. So you can recognise all admixtures".

Ibn Sīnā believed that urine analysis was of great importance for the determination of the state of liver and vessels. He mentions seven categories of signs : colour, state, transparence and opacity, sediment, abundance and scarcity, odour and froth. He gives a minute description of the colour of the urine in jaundice patients, with its characteristical yellow sediment, which is explained by the fact that the bile, because of an obstruction, does not pass into intestine in the normal and natural way, but has to accompany the urine so as to be excreted with it. This occurs when there is "a deficit in the liver's force"; for instance, in ascites. In "acute diseases of the blood", the colour of urine resembles that of blood. The appearance of blood is caused not by the rupture of the vessels, but by their congestion. The significance of the urine deposit is discussed in detail, especially for prognosis of the disease. Thus, if the excretion of watery urine is associated with insomnia, mental disorders and headache, one should expert nasal hemorrhage, but the reason of all these phenomena may be stones in the kidneys.

Black urine in patients with diseases of kidney and urine in patients bladder, as well as in elderly people, is always an ominous sign. Red urine with renal diseases is a bad sign; it indicates a hot tumor (hypernephroma?), and headache be taken as mental disorder (vascular crisis?). In patients with tumors of the kidney, the urine has a stable red tinge, and there is no deposit. Turbid urine with a red shade is noted more frequently in patients with tumors of the liver.

Further, Ibn Sīnā speaks diagnostical guides according to the criteria of translucence and opacity of the urine. He notes that the excretion of watery urine with simultaneous pain in the lower lumbar region and the kidneys, indicates a tendency towards tumor formation. Thick urine with a deposit of olive colour in a sign of stones. The presence of threads in the urine indicates that it has been

taken after sexual intercourse. Ibn Sīnā describes in detail the signs of urine sediment : its quantity, quality, composition, the position of particles, the time and place of their sedimentation and the state of their mixture. Thus, without microscopy, by simple but meticulous investigation the great physician obtained much more valuable information. In most cases, the deposits have the colour of the urine; the best colour is white then follow red, yellow and orange. The worst colour is that of lentil. It is essential that modern nephrology should pay attention to the possible use of the above-mentioned simple prognostical signs. The following statement of Ibn Sīnā is worth mentioning : "You must not expect that the urine of lean patients should contain the same amount of deposit as that of obese patients". In renal diseases the urine deposit is sometimes of red meat colour (*erythrocytes?*), but the "meat-like" deposit can also be observed without lesions of the kidneys. Purulent sediment is more characteristic of the urinary tract lesions, while sandy deposits indicate stones. Ibn Sīnā knew many other signs, such as anuria and polyuria, particularities of urine depending on age and sex, in expectant mothers and in those who have given birth to a child, and so on. The *Canon* contains so many aspects of urine that it is worth while studying them by means of computers in order to assess them from the stand-point of modern knowledge.

In order to assess the state of intestine, Ibn Sīnā recommended the quantity and quality of the faeces, their colour, odour and "the taste in the mouth". Examining the material of hemorrhagic stools, he could locate the process in the great or small bowels. Wet faeces are a sign of bad digestion, frothy faeces occur in high fever, dry faeces are observed in polyuria or when the content of the bowel remains in it for a long time. White faeces are charateristic of obstruction of the biliary tract; "the faeces that have lost their usual colour bespeak jaundice."

It is known that boys. especially girls, at the beginning of sexual maturity often have dyskinetic troubles and a tendency of spastic contractions of the intestine. Ibn Sīnā was well aware of it and says : "the readiness to digestive disorders and spasms hinders evacuation. The age that has not reached complete maturity also hinders evacuation."

Along with diagnostical signs (symptoms), Ibn Sīnā recommended a consideration of their certain combinations, that is to say, syndromes. Thus, restlessness in the face, eyelids and fingers should warn the physician of the necessity of "correcting the state of the liver, otherwise the patient will develop ascites." Headache associated with redness on the face and eyes is an indication for venesection.

To recognise a disease in time, Ibn Sīnā takes into consideration such general signs as the loss or increase of appetite. It is important to heed all kinds of changes, in general, all changes of the usual state of appetite, stools, urination,

libido, sleep, sweat, itching, acuteness of memory, taste, frequency of noctural pollutions, should this change manifest itself in an increase or decrease in quality; all this betokens a disease."

Origins of Concept of Cirrhosis of the Liver

The term, "cirrhosis" was first applied to the liver by the French physician Laennec in 1819, when he described the disease of a 47-year-old soldier "with ascites, hemorrhagic pleuritis and organic lesion of the liver". The liver of the soldier was very small, of yellow-grey colour, and had a tuberous surface. However, the disease, which was termed "cirrhosis of the liver", was known long before.

Speaking of the origins of the concept of cirrhosis of the liver many authors refer to the anatomists of the sixteenth century, who had described a hard scarred liver found in autopsy. However, a detailed description of the disease can be found in the *Canon* : "When the state of the liver deteriorates and it becomes weak before the development of ascites, the skin turns pale or yellow and the liver becomes small. Ascites due to the hardening of the spleen (subhepatic blockade ? Banti's syndrome ?) is much safer than that owing to the hardening of the legs. If there is an ulcer, it heals with difficulty. The patients excrete little urine, the 'winds' become abundant, the abdominal walls become distended; sometimes the scrotum and testicles become distended too. If such is the case, the fluid can exudate. Various diseases may precede ascites, including obstructions that obliterate the mouth of the vessel (thrombosis of the portal vein ?) and the hardening of the membrane that surrounds the liver. It is easy to see that, in the latter case, Ibn Sīnā had in mind the patients whose condition was later connected with the name of Curschmann. In 1884, Curschmann described chronic hyperplastic perihepatitis in polyserositis associated with pericarditis; it is the so-called glazy liver, the development of which the major part is played by inflammatory process, while congestion of the heart is of less importance (A. L. Miavsnikov, 1949). It is in Curschmann's pseudocirrhosis that the abdominal wall adjoining the liver becomes thick with abundant fibrin deposits of whitish colour, resembling sugar glaze; this "membrane" not infrequently presses upon the liver and distorts it. On section, the hepatic tissue is congested and the connective tissue fibers are thick; in advanced cases, the liver parenchyma is considerably atrophied.

Thus, we have reasons to believe that Ibn Sīnā had treated the condition that was studied and described by Curschmann nine centuries later.

On Cancerous Tumor of the Liver

In the second volume of the third book of the *Canon*, where cancerous tumour of the liver is discussed, Ibn Sīnā speaks of two varieties of the disease which seem to correspond to modern conceptions : (i) the variety that develops

from the preceding "hot tumour" (Ibn Sīnā meant probably the development of cancer of the liver after hepatitis with transition to cancer-cirrhosis); and (ii) the variety that develops from the very beginning, as "hard tumour" (hepatoma ?). Such a tumour can be well determined by palpation of the right hypochondriac region, especially when the patient has no ascites. The abdominal walls, in this case, are thin and weak. Hence, it is not difficult to detect a semilunar, almost painless, tumour. At the same time, if there is no pain at all, it means that the tumour "is going to destroy the organ". Sometimes, cancerous tumour causes hiccup and vomiting, loss of appetite, emaciation and general weakness; the face turns grey, and the liver hardens rapidly. Ibn Sīnā affirms that no one has ever recovered from this hard tumour of the liver. His detailed description of the treatment of hepatic tumours and the long list of drugs he recommended, are meant not for cases of cancerous tumour, but for inflammatory and traumatic lesions of the liver.

Thus, the clinical manifestations of "hard tumour" of the liver described by Ibn Sīnā correspond exactly to those of primary massive cancer of the organ, i. e., hepatoma. It is quite stricking that Ibn Sīnā knew the existence of two varieties of the disease, viz., primary cancer of the liver and cancer-cirrhosis. He described a sufficiently complete clinical picture of hepatoma and gave a correct prognosis of the disease.

Chronic Constipation in the Canon and the Actual State of the Problem

The concepts regarding the causes of origin and development of diseases changed with the progress of medicine. But there were not only progressive achievements, but also sometimes a regress in certain, fields of medicine. As an example, we can point out the certain evolution of concepts of constipation. The latter term denotes intervals between evacuation of the bowels which, at times, are as long as five to seven days. Ten centuries ago, Ibn Sīnā spoke of various of constipation-weakness of expulsive faculty, lack of desire to expulse ("for expulsion is aided by will-power"), combination of those factors, including diseases of retention (tumours, polypa of the colon etc). Thus, our great predecessor recognised constipation caused by insufficiency of active and passive movements, by neuropsychic factors. This list might be completed by the addition of endocrine constipation (caused by hypothyreosis, hyper-parathyreosis, hypocorticism, *diabetes* millitus pregnancy, climax), by disorders of the systemic and abdominal blood circulation and by indiscriminate use of a great amount of various drugs in our time. Modern ideas on pathogenesis of constipation closely correlate with Ibn Sīnā's concept: (i) disorders of coordination of intestinal contraction or disorders of the colon tonus (which is not termed dyskinesia of the colon, the action of hormones); and (ii) disorders of the act of defecation.

The great physician understood perfectly well the connection of defecation disorders with pyschogenic inhibition of the act, weakening of the somatic muscles

taking part in it, decrease of sensitivity of the receptor apparatus of the rectum, and lower pelvic musles. By these, he meant "the lack of desire to expulse".

In the beginning of the twentieth century, the English surgeon Lane suggested that intestinal stasis was due to the bands and angulations in the intestine caused by the transition of human being into an upright stature. Lane's viewpoint was developed by many authors who regarded these formations as congenital (V. N. Rozanov, 1911; Jackson, 1902) or as caused by inflammation (Carno, 1930).

There were authors who explained the development of chronic constipation by ptosis of the transverse colon with the formation of sharp angles both at the rights and left side. The explanation of the development of chronic constipation by anatomical alterations, both innate or acquired, is not satisfactory, as it does not take into consideration the capacity of human organism for adaption, which is sufficiently great (A. G. Gukosian, 1959). We could mention such innate anomaly as megasigma which is not always associated with constipation. Many outstanding Soviet physicians (V. N. Smotrov, 1930; M. I. Pevzner, 1940, and others) rejected the enteroptosis conception as the explanation for the development of chronic constipation although they admitted that congenetal and acquired anatomical changes might aggrevate the course of the disease.

Ibn Sīnā's concept of the origin of constipation due to "weakness of expulsive force" found confirmation in our days in the works of Nothnagel and U. D. Kitaigoradskaya, M. I. Pevzner and many others. The authors regarded constipation as the consequence of the weakness of neuro-motoric causes. The concept of "the weakness of expulsive force" is confirmed by the information on the part played by neuro-psychic factors in the development of chronic constipation. The sympathetic plexus of Auerbach must be intact for a normal functioning of the bowels.

Unfortunately, this main component of the nervous regulation is subjected to various noxious agents, including neurotoxins, that are taken in with food or produced in the course of intestinal inflammation.

Ibn Sīnā paid great attention to the rate of nutrition: "one should not take too much food in one time, it is better to eat little food frequently. Excessive food leads to torpor, distention of abdomen, accumulation of winds"......

As to the use of milk by persons suffering from chronic constipation, the following recommendation of Ibn Sīnā is worth mentioning; "Milk is useful for those who drink in with pleasure and who do not feel afterwards a tention in the abdomen, especially in the hepatic region, and there is neither pain nor itching". He knew, therefore, that milk is not tolerated equally by all people, and that some are allergic to it.

Among the remedies used for "mollification" the *Canon* mention bind-weed boiled in salted water and flavoured with myrrh and olive oils, and the root of polypody added to chiken broth or to soup made of beet or cabbage. A good remedy is ginger syrup and other syrups with similar effect. For elderly people, the *Canon* recommends a remedy prepared from the core of safflower and dried figs, the latter taken ten times as much as the former; the remedy is taken in the dose of one nut. Oil enemas are also recommended.

In conclusion, it may be noted that, at present, many data have been accumulated on the important part played by the great bowel. But, the management of chronic constipation, which ranks among the digestive diseases, is far from being perfect, and the multitude of various laxatives, is an evidence in favour for this. Reading the great Ibn Sīnā, we see how little we have achieved during the last one thousand years in the struggle against consitipation, one of the worst scourges of our time.

On the Regimen of Nutrition and the Assessment of Water

Many recommendations of Ibn Sīnā on the regimen of nutrition can be accepted as absolutely valid in our days, For instance, "eat when you have appetite and do not restrain it when it grows". We understand now, in the latter case, that, otherwise, an agressive juice would act in the stomach, contributing to the formation of ulcer, especially in the case of those predisposed to this disease. Ibn Sīnā was aware of the agressiveness of such juice : "as a result of hunger, the stomach is filled by bad ichorous juices". But he considered also excessive nutrition to be noxious : "if an excess is felt, it should be eliminated immediately...' and you should know that there is nothing worse than overeating..." "Oversaturation, no matter with food or with drinking, brings death. Many people became suffocated and died of oversaturation".

Ibn Sīnā recommended a combination of various kinds of foods in order to bring about a desirable equilibrium. Thus, the effect of cucumber and pumpkin is counterbalanced by garlic and onion. If someone has eaten food that creates "obstruction", then he should take in the food that "opens the orifices" and later he should fast for a while. Anyone who wishes to be healthy, should act in this way, until his appetite is restored and his stomach and upper intestine get rid of the previous food. Ibn Sīnā warned not to take any food until the stomach became free of its content : "the most noxious thing is to take food upon food which has not been digested". However, sometimes it is necessary to take some food after meal to help digestion. For instance, after a meal that contained much salt or pepper, it is desirable to take a "moistening" kind of food in order to improve the chymus of the first food. After rough food, Ibn Sīnā recommended eating something pungent, readily digestible, and light exercise according to the quantity of food in the stomach, especially if the man is inclined to sleep after meal.

Ibn Sīnā recommended hot meals with great caloric content in winter and light cold food in summer. He warns that the stomach should not be filled to such a degree that there would not be any more room for extra food; one should cease eating while having some appetite which will disappear in a short time.

Avicenna advises fast after taking too much food. In this case it is useful to walk slowly for a while and to take a little amount of pure wine; one should sleep on the right side, then on the right side again, and the legs must be placed lower than the head.

In his Canon of Medicine, Ibn Sīnā considers some problems of incompatibility of food products. This is important in our days, as it may open new possibilities for the struggle against increasing allergization of man kind. Thus, it is not advisable to take milk simultaneously with fish or with acid food. Many others ancient and mediaeval physicians and philosophers paid attention to this problem. We should like to mention especially Arnold of Villanova, the author of the famous poem, "*Regimen sanitatis salernitanum*, written in the fourteenth century.

Although the concept of vitamins came into being at the end of the eighteenth century (as a result of the well-known experiments of Lunin, and the term was coined by the Polish scientist K. Fruk in 1912), we can read in the *Canon* about "food drugs" that stand nearer to drugs than to food, "some of which are near to food matter, such as syrups, egg yolk, meat juice...". It is clear that he knew of vital substances which he called "food drugs". Besides, he had understood very well the role of water in nutrition as well as the beneficial and harmful effects of wine.

General Principles of Treatment

As to the general principles of treatment expounded in the *Canon*, they are very much in accordance with those of modern medicine. Ibn Sīnā recognized three principles of treatment : (i) regimen and nutrition; (ii) drug therapy; and (iii) manual action.

Considering the general principles of drug therapy, Ibn Sīnā speaks of three rules : (i) for qualitative choice of the drug; (ii) for quantitative choice of the drug; and (iii) for administration of the drug itself.

He paid great attention to the part played by the nervous system in the development of the disease and tried to cure the patient by appropriate action. Therefore, we have every reason to regard Ibn Sīnā as a founder of 'nervism' in medicine.

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AL-BĪRŪNĪ ON THE SCIENCE OF MEDICINE

R. L. VERMA

A genius and a scientific luminary of Central Asia, Abū Raiḥan Muḥammad bin Aḥmad al Bīrūnī (973-1051 A.D) made literary raid, as it were, on India with Sulṭan Maḥmūd Ghaznavid (998-1030 A.D). Besides being a competent *hakīm*, he was also a historian, geographer, astronomer, mathematician and poet. Al-Bīrūnī was conversant not only with Arabic, Persian, Turkish, Syriac, Hebrew and Greek languages but was also a scholar in Sanskrit. It was he who was responsible for the introduction of Sanskrit translation of the Islamic *Kalima* avyaktam ekam, Muḥammada avatāra* on the coins promulgated by Sultan Maḥmūd in his domains in India.[1] During his extended stay in India for nearly twelve years, the savant not only acquired considerable knowledge of Indian sciences but also taught Greek sciences to the Indians. Al-Bīrūnī is considered to be the first to introduce the study of *Bhagvad Gītā* to the Muslim world and also the first Muslim to study the *purāṇas* and to translate *Pātanjali* and *Sāṃkhya* into Arabic language.

As regards Indian i.e., Āyurvedic medicine, it can be said that al-Bīrūnī did not make a special study of it, but merely tried to explain the doctrines of Indian medicine according to Caraka, without making any effort either to defend or refute them. Besides, he also rendered the Sanskrit text on loathsome diseases into Arabic. As we turn over the pages of his '*Kitāb fi Taḥqīq mālī'l Hind*' we find a few references to medical terms based upon the studies of Arabic version of the *Caraka Saṃhitā*, such as the origin and transmission of Āyurvedic medicine, art of *rasāyana*, smallpox and its cure, the effect of charms on the cure of snake bite, months of pregnancy, duration of menstruation and the effects of moonlight etc. Al-Bīrūnī mentioned the geneology of the teachers of Āyurveda and its transmission to the various *ṛṣi* (whose medical texts are extant today) as follows,

"According to their belief, Caraka was *ṛṣi* in the last *Dvāpara-yuga*, when his name was Agniveśa, but afterwards he was called Caraka, i.e. the intelligent one, after the first elements of medicine had been laid down by certain *ṛṣis*. Agniveśa had received them from Indra, Indra from Aśvin, one of the two physicains of the *Devas*. Aśvin had received them from (Dakṣa) Prajāpati i.e., Brahman, the First Father".[2]

From al-Bīrūnī's statement, one gets an impression that Dakṣa Prajāpati was Brahmā, the first propounder of the Āyurvedic medicine, whereas the fact is that Dakṣa Prajāpati acquired medical knowledge from Brahmā. This may be due

*Lā ilāha illa'l-Allāhu Muhammad Rasāl Allāh.

to the fact that at-Bīrūnī's studies were based entirely upon the defective Arabic translation of the *Caraka Saṃhitā* by 'Ali bin Zain of Ṭabaristān during the 'Abbāsid period. According to the original Āyurvedic texts, Brahmā, the first propounder of Āyurveda propagated this science through Dakṣa Prajāpāti, who in turn, taught Āyurveda to the legendary Aśvinī Kumāras—the celestial physicians to the gods. The Aśvinīs imparted the science of Āyurveda to Indra, the chief of gods in heaven, who was supposed to have transmitted the same to the mortal *ṛṣis*. The Ātreya school of medicine believes that the first mortal who received the science of *Āyurveda* was Bharadvāja; and the Dhanvantareya School of surgery considered Kāśirāja Divodāsa (Bhagavan Dhanvantari in his mortal form) as the first person to be favoured with this knowledge from the gods. But, in the South, the tradition credits the sage Agastya—popularly known as Kudamalai Siddhar, being the first mortal to receive Āyurveda from the gods.[3]

In another chapter of his book on India, al-Bīrūnī added some more information, particularly on the eighth month's pregnancy, as quoted by Caraka: "The column relating to the months of pregnancy is to be completed by the remark that consider the eighth month as standing under the influence of a horsocope which causes abortion. According to them, the embryo takes, in this month, the fine substances of the food. If it takes all of them and is then born, it will remain alive; but if it is born before that, it will die from some deficiency in its formation".[4]

Al-Bīrūnī went further and tried to solve this problem with the aid of Hindu astrology as stated by Caraka and explained thus: "The ninth month stands under the influence of the Moon, the tenth under that of the Sun. They do not speak of a longer duration of pregnancy, but if it happens to last longer they believe that, during this time, some injury is brought about the wind. At the time of the horoscope of abortion, which they determine by tradition not by calculation, they observe the conditions and influences of the planets and give their decision accordingly as this or that planet happens to preside over the month in question".[5]

It is still a popular belief, even among the educated persons of Europe that an eighth month fetus will not survive. In India. even today the eighth month of pregnancy is referred to as 'the unnumbered month'. Mansūr bin Muhammad bin Ahmed bin Yūsuf, the personal physician of Sultān Zain-ul-Ābīdīn of Kashmir (1422-72 A.D) remarked on the subject that, if an eighth-month fetus is healthy and strong, it ruptures the membranes and makes its way out and by the grace of God he survives; if he is extremely week, he dies in the abdomen and, if born, he dies soon after birth. The real explanation of this belief is given by Muslim astrologers and is quoted with the approval of Ghiyath-ul-dīn Isfahānī (15th century A.D.). "The first month of intra-uterine life is dedicated to Saturn (Zuhī), while the seventh month of conception stands under the influence of the Moon (*Qamar*). If a child is born during seventh month, when the seven planets have completed their ascendency; he is destined to survive, because the moon is an auspicious planet of his

life. But if the child is born in the eighth month, the Saturn again is in ascendence and Saturn is a planet of illomen and stands for embryo's death. Hence, an eigth-month foetus is improbable to survive".[6]

It appears from the explanations of *Ūnani* physicians that like Indians, they also believed for many medical problems astrological arguments rather than explaining medical theories on the subject. As far as our medical knowledge is concerned, we can say, if a fetus is born before the sixth month, it dies at once; but, from the sixth month onwards, it may move and breathe for a little time. Children are sometimes brought up and become quite strong and healthy, if born at the end of the seventh month. For example, George III and Sir Isaac Newton are said to have been so born. The nearer a child comes to its full term, the better the chance it has for surviving, although it is a popular superstition that seventh month children are stronger than those of the eighth month and are able to live in the macrocosm.

Again, in his work, which represents the zenith of his scientific thinking, al-Bīrūnī described the effects of moonlight of human beings, on the tides and other things in the world. He stated thus:

> "That the Moon has certain effects on moist substances, that they are apparently subject to her influences that, for instance, increase and decrease in ebb and, flow develop periodically and parallel with the Moon's phases, all this is well-known to the inhabitants of sea-shores and seafaring people. Likewise physicians are well aware that she affects the humors of the sick people, and that the fever-days revolve parallel with the Moon's course. Physical scholars know that the life of animals and plants depends upon the Moon, and experimentalists know that she influences marrow and brain, eggs and sediments of wine in casks and jugs, that she excites the minds of people who sleep in fullmoon light, and that she affects linen clothes which are exposed to it. Peasants know how the Moon acts upon fields of cucumbers, melons, cotton, etc, and even make the times for the various kinds of sowing, planting and grafting, and for the covering of the cattle depend upon the course of the Moon. Lastly, astronomers know that meteorologic occurrences depend upon the various phases through which the Moon passes in her revolution".[7]

Stories about Dracula and other well-known 'horrors' were inspired by the Werwalves of the Middle Ages On a more factual level, the records in New York City reveal that David Berkowitz, a postal employee who called himself 'Son of Sām' carried out his eighth slayings on full-moon nights. Statistical analyses based on data obtained from police files throughout the United States indicate that the murder rates increase by 50 per cent and cases of arson by 100 per cent on full-moon nights.

Examples of lunar madness have been chronicled throughout history, but pioneer research is being done on the subject by Ralph W. Morris of the University of Illionois (Chicago). The data submitted to him by the psychiatry departments in hospitals and mental institutions, revealed that there was a marked increase in aggressive responses, anxiety attacks and bizzare behaviour patterns among patients, both prior to and during these periods. He also accumulated evidence which would show that the effects of full-moon are not confined to emotion, but are biological as well. For example, enzymes are more active during full-moon and blood pressure, heart-beat, and metabolic rate accelerate during this time. Heart patients are more prone to attacks of angina pectoris, during this period. Strokes, epileptic seizures and haemorrhages are more frequent, while bleeding ulcers are likely to act at these times.

The medical implications of his findings are not fully understood. However, Morris suggested that the patients with chronic conditions that are likely to be aggravated during full-moon, should prepare themselves relatively uneventful. He believes that the key to the successful therapy lies in chrono-pharmacology. Laboratory experiments on test animals with appropriate drugs are encouraging. Morris hopes that these studies would eventually find application in the treatment of human 'full-moon related' disorders.[8]

Al-Bīrūnī wrote another non-medical work, *al-Athār ul-Bāthiya 'an al-Qurūn ul-Khāliya*' (The Vestiges of the Past Ages) most probably in 1000 A.D. in which he discussed for the first time some interesting medical theories in Arabic literature, such as Caesarean section and the identification of flowers by counting the number of their petals. The surgical operation which forms the subject of a picture reproduced in the above mentioned book receives only a passing reference in al-Bīrunī's work, as he stated as follows:

> "The word 'Caesar' (*qaiṣar*) means in Frankish 'he has been drawn forth after a cutting has been made.' The explanation is that his mother died in labour pains, while she was pregnant with him, her abdomen was opened and he was drawn out and got the surname 'Caesar'.[9]

Some linguists and historians mentioned four different opinions reflecting the origin or source of the Latin '*Caesar*', for example, (a) the word signified an elephant in Punic language (of the Moors) and Julius certainly used an elephant as a symbol on some of his coinage; (b) it was given to one of Julii because he had been cut from his mother's womb after her death (*Caesus*); (c) because he had been with a great quantity of hair on his head (*Caesaries*); and (d) he had azure-coloured eyes (*Caesii*). Of these four divergent views, the second is the adopted by al-Bīrūnī, and by the author of famous Arabic Persian dictionary '*Ghiyāth-ul-Lughāt*'.

It appears that he Caesarean section was named after Julius Caesar (b. 100 B.C.) as a result of misconception based upon incorrect statements in historical books that Julius Caesar was born by this procedure. But this explanation is untrustworthy, because, in Roman times, this operation was performed only upon the dying or dead women to save the life of the fetus, while Caesar's mother Aurelia lived many years after her son's birth. She died while Caesar was campaigning in Gaul. The other Roman generals—the elder Scipio Africanus Caesar (b. 237 B.C.) and Manlius Torquatus Caesar are also said to have been delivered by Caesarean section and, therefore, had Caesar as a part of their names. It is also on record that the first of the Julian family occurring in the history as having obtained the surname of 'Caesar' is Sex, Julius Caesar (208 B.C.), the Praetor.

'*Qaiṣar*', the Arabic and Persian form of the Latin '*Caesar*' occurs in the quotation of the '*Saḥih-ul-uslim*' where it is applied to Emperor Heraclius, who received a letter from Muḥammad, when he was at Edessa on his way to Jerusalem, inviting him to embrace Islam.[10] The only other example that al-Bīrūnī illustrated of such an operation being performed is that of the birth of Aḥmad bin Sahl bin Hāshim (most probably who revolved in Khurāsān (Iran) against the Sassanid Naṣr bin Aḥmal (918-919 A.D.). Al-Bīrūnī gave no indication of any other instance of this operation having been performed in his own time. It is, however, noteworthy that his great contemporary poet, Abu'l Qāsim Firdawsī (c. 932-1021 A.D.) described in his well known '*Shahnāmah*', the birth of great Rustam after the performance of such an operation on his mother Rūdābeh, which is known in modern times as Caesarean section.

Al-Bīrūnī is also considered to be the first to suggest that the flowers could be identified by the number of their petals. He reached these words to express the same idea in his book of '*Chronology*'. "All numbers are stamped on life and nature, above all on flowers, the number of whose petals, petioles and venules is a characteristic of each of their genera.... It is a strange fact that, whenever the petals of a flower have a circular base, their number generally obeys certain laws of mathematics, and most of them correspond to the number of equal chords that can be inscribed into circles by elementary geometry. It is rarely indeed that we come across a flower with seven or nine petals, for the corresponding chords cannot be so inscribed. But there are arrangements of three, four, five, six, eight and ten petals. It is possible that, in time, genera of flowers with seven or nine petals may be discovered, or that these numbers are found in certain teratological specimens. Truly, nature limits her genera and species so that, should we count the seeds of a pomegranate, we are bound to find that another pomegranate from the same tree has the same number of seeds.[11]

Besides non-medical works, al-Bīrūnī also composed a medical treatise, '*Kitāb ul-Ṣaidana fi'l-Tibb*' (*Book of Pharmacology in Medical Science*) in his ripe age with the aid of Hakīm Abu Hamid Aḥmad bin Muḥammad al-Naḥshaī of

Ghaznah (Afghānistān), the Director and Administrator of the hospital established and financed by the Ghaznavid sultāns. In broad sense *'al-Saīdana'* may be classified into two major sections; (i) Introduction to the art of apothecary, pharmacology and useful historical explanations, consisting of a brief preface and five chapters; and (ii) Materia medica arranged in alphabetical order. The author traces the origin of names of about 720 simple drugs with etymological identification and compares one species with another in this treatise. Al-Bīrūnī was much interested in this subject, as recorded by some historians. He used to visit a Unānī physician in Khwārazm carrying with him different varieties of plants, seeds and fruits to learn their Greek equivalent names from him and kept a record of these. Al-Bīrūnī's approach to foods and drugs was based upon a classification of assimilable substances, as he himself stated in the introduction of his *'Saīdana'*.

> "Everything that is absorbed, voluntarily or unconsciously, can be divided first of all into foods and poisons. Remedies are placed half-way between these two. Foods receive their qualities from active and passive forces, and primarily from their four degrees, so that the body, in equilibrium, has the power to transform nutrimnt into its own substance by complete digestion and by assimilation, thus replacing what part of the diet has been lost by disassimilation. That is the reason why the body much act on food before it can derive any benefit from it. As for poisons, they receive their qualities from the same forces but at their highest degree, which is the fourth, in such a way that they overpower the body and subject it to morbid and fatal transformations.... As for drugs, they are placed between the two, because they are corruptive with respect to food and curative with respect to poisons. Their (curative) action can be wrought only by skilful and scrupulous physicians. In addition, there are the medicinal foods, half-way between drugs and food, and the toxic medicaments, half-way between drugs and poisons".[12]

Describing *'al-Hāj'* or *'Ushturkhār'* (plant producing 'manna' of the Biblioscal fame), Al-Bīrūnī quoted an insect, *Trabutina manniparra*, for the first time, as the causative agent for the secretion of manna of certain trees (in Sinai desert), just as lac is produced by the puncture of lac insect on certain trees in India. However, he explained this procedure thus: "The author of *al-Mashāhir* says that *'al-Hāj'* is a shrub of small size growing on saline soil. Its fruit is red like blood and it is called *'Ushturkhār'* (camel's thorn). Al-Fazārī says it is in Sindian language called *'Jawāsa'*. Concerning its growth on saline soil, this statement is not correct; it chooses the best earth, and it grows even on top of rocks. Should you dig it out with its roots, you will not stop until you reach water and moisture and sometimes it may lead you to a depth of 200 cubics. Its fruit has seeds of the size of Egyptian millet which are red; but not as red as millet. These are compressed with a bag (pod) of the same colour. It is crooked like the tail of a scorpion. Its leaves are contracted and form a hollow in which a green coloured insect is generated with a

flattened head. When the leaf is opened, the insect leaps forth, how long it survives, is not known. This insect yields *manna* (*Taranjubin*) in some places".[13] Before the nineteenth century, *manna* was regarded in the Orient as well as in the Occident, as a kind of honey-dew falling from the heaven on certain plants for the people of Moses. While explaining *'mann'* (manna), al-Bīrūnī recorded the method of formation of manna, quoting Ibn Sarābiyūn (9th century), a Syrian Christian physician. Here, he cited as under that the activity of heat of the Sun causes the plant to exudate *manna*; "When the vapours rising from the fruit trees, the rivers and Earth are matured by the action of the Sun rays in the higher spheres and are cooked. They acquire a sweet and thick quality and when concealed by the cold of the night, they become thick, solid and heavy and descend upon the Earth as well as the trees like dew. This is the honey-dew (*Asl-ul-Ṭull*) and it is manna (*mann*). The procedure of honey preparation is similar.[14] Some thirteen or fourteen plants in India are known to yield, under the parasitic influence of insects or otherwise, a sweet fluid called *manna*. This is regularly collected and like honey; enters more largely than sugar into the pharmaceutical preparations of the Hindus.

Al-Bīrūnī also explained the phenomenon of opium addiction and tolerance of the addicts to large doses of it to relieve the body from all ill-effects of scorching heat of the sun. In another chapter of the same book, al-Bīrūnī referred to the skill and wisdom of the Indian physicians and the marvellous cures which they achieved by administering aconite to cases of haemorrhoids and this is evident from an anecdote narrated by the master himself. He recalled how an eminent citizen of Gardīz (South-east of Ghaznah in Afghānistan) told the following story:

"The father of this eminent citizen was inflicted with painful haemorrhoids. He consulted most of the doctors in the area; but all their treatment was of no avail. Then an Indian practitioner, among these toxocologists, examined him and claimed that he can cure the afflicted patient. Thereupon, his son asked this doctor, how much his fees would be and how he will go about it? "There will be no charges", the doctor responded, "until your father is completely healed. Only then you will pay me what you feel right and compensatory". "What are you going to use for cure, surgery or cauterization?, the son asked. The Indian doctor answered, "None of these ..". Removing the patients' clothes, he uncovered the region at the groins and above the kidneys, making a small incision with his lancet and rubbing it with Indian aconite till blood squeezed out. He also recited the usual incantations, and gave the patient a small dose of the aconite to drink. Thereupon, the patient fainted and was left to recover. Thereafter, the doctor waited for few days till the incision healed. He then used the lancet and the aconite as he did before, and repeated the same procedure several times. Finally, the haemorrhoids healed completely. The man, who lived a long life, never again had this trouble, and the 'doctor' was generously rewarded".[15] Al-Bīrūnī also reported that in Indian literature, mention is made to the presence of a special class of Indian healer or *Vaidyas* in Afghānistān in those days who used to treat the patients by using poisons in

different forms. He himself read and heard much about these but the exact manner and scientific approach of their treatment was not understood until compiling this work.

Al-Bīrūnī's Arabic *'al-Saidana'* was rendered into Persian by Abū Bakr bin 'Alī bin 'Uthmān al-Asfar al-Kāsānī in the reign of *Shams* ul-dīn Iltātmish (1210-1236 A.D), the ruler of Delhi. Al-Kāsānī's choice fell on al-Bīrūnī's Arabic *'Saidana fi'l-Ṭibb'* for the simple reason that by rendering it in the Persian its scope for utilization would be wider. He states thus: "After meditation and conciliation for the divine favour and deliberation and consultations, it was decided that before seeking attendance to the king, 'kitab *ul-Ṣaidana'* of al-Bīrūnī be rendered from Arabic into Persian, for the utility of this fine book is immense. Abu Raihan who was most distinguished in respect of his insight in the medical and natural sciences, had spared no pains in this work and had critically examined all the points discussed by the early and later ḥakīms regarding the discrenment of simple drugs, their characteristics and particulars and their names in various languages. And since his work was in Arabic, its utilization was confined only to those who were well-versed in Arabic language. And when it is rendered from Arabic into Persian, its scope of utilization would be wider and more comprehensive".[16]

It is interesting to point out that the original article in Arabic on Chinese tea, noted for the first time by F. Krenkow, is missing, and is available only in Persian translation with an abridged retranslation into Arabic. This information on tea is based upon a British Museum manuscript. "Tea *(Cāi)* is a kind of plant and its place of origin is China. It is of great use and words off the ill-effects of drink. Due to this fact they export it to the land of Tibet, because the people of Tibet are very much accustomed to drink wine and there is no other remedy as efficacious against its harm. The persons who bring it to Tibet take no other price in payment except musk. In the book *'Akhbār-e-Chīn'*, it is recorded that its taste is sweet with slight bitterness but, when boiled, its bitter taste leaves it. They drink it with warm water with their meals and assert that the tea takes away the body heat and purifies the blood".[17]

After describing some uses of tea, al-Bīrūnī further added an interesting anecdote which speaks about the origin of tea and its stimulating effects, as follows:

"Once the Chinese Emperor got angry against one of his courtiers and commanded that he be removed from his audience and exiled to the mountains. This person who yellow faced, much grieved and in depressive mood, one day he was driven by excessive hunger went to the jungle (in search of food). By chance he discovered this plant (tea) and took it. In a short time he regained health, became alright and stronglooking. By continuing this process, he achieved perfect health and energy. One day one of the courtiers passed by that way and was

much astonished to see him hale and hearty. He informed the king and explained the whole story. However, the Emperor ordered that he be brought before him. The Emperor was surprised to see him in good physique and wanted to know the reason of his condition. He confessed what had happened and explained the virtues of this plant. Then they made experiments on this plant and became aware of its actions and entered into their own materia medica".[18]

There is a Chinese legend which places the introduction of tea drinking in the reign of the mythological Emperor Shen Nung (c. 2737 B.C.). But the earliest credible mention is 350 A.D. When tea was described by 'Kuo Po' in the ancient Chinese dictionary. It was being used in China as a medicine and was called '*tscha*'. The favourite legend of the origin of tea concerns Bodhidharma on Daruma, a Buddhist saint, who having fallen asleep over his devotions, cut off his eyelids on awakening, and threw them on the ground, where they took root and grew up as a bush, the leaves of which, when dried and infused in hot water produced a beverage that would banish sleep. It has also been recorded that it was the famous Budhist reformer, Eisai (1141-1215 A.D.) who originated the cultivation of tea in Japan in 1191 A.D. Moreover, in order to overcome popular prejudices against it, he wrote a book, the *Kissa yojo ki*, wherein he described the virtues and and hygienic values of tea.

It is rather strange that the Arabic authors who wrote on Chinese affairs have nothing to say about the use of tea among the Chinese. In the splendid collection of Arabic texts gathered and interpreted by C. Ferrand, tea is not mentioned. Similarly, it is not available in the pharmacology of Abū Manṣūr Muwāffaq (fl. 975 A.D.) and in the vast compilation of Ibn Baītar (d. 1248 A.D.). The Arabic merchant *Sulaimān* (fl. 851 A.D.) appears to be the first foreigner who states about the use of tea leaves as a beverage among the Chinese. Ramusio, in the posthumous introduction of his edition of Marco Polo (published in 1545 A D.) mentions having learned of the tea beverage from a Persian merchant, Ḥāvī Muḥammad. Mandelslo in his *Travels* (1662 A.D.) reports that the Persians, instead of tea, drank their *qahwa* (coffee). At our ordinary meetings everyday we took only '*The*', which is commonly used all over the Indies not only among those of the country but also among the Dutch and English, who take it as a drug. It is curions, however that in the *Ain-i-Akbari* (1590 A. D.) no mention is made of tea.

In the field of optics, al-Bīrūnī composed '*Kitāb-ul-Lam'āt* (*Book of Illumination*) which was mentioned by Ghulam Husain of Jaunpur (India) in his text '*Jāmi' Bahādur Khāni* (1835 A.D). This work deals with optics. The author selected four figures from al-Bīrūnī's '*Kitāb-ul Lam'at*'. As far as we know, this book has not been discussed by any of the Orientalists. Even if this treatise is traced, it would be most interesting to compare its contents with the original researches of his contemporaries Ibn Haiṯẖam(965-1038 A.D.) and Ibn Sīnā (980-1037 A.D.) in the field of optics in refuting the Greek traditional theory of vision, i.e., 'emanation

hyphothesis.'* Alhazen proved that objects are seen by rays passing from towards the eye and not by the opposite process. He further added that "the image are refracted on the surface of the crystalline humour (in such a manner) that their entire positions are reversed".[19] Al-Bīrūnī and Avicenna both agree independently in his theories.

A deep study of this paper shows that al-Bīrūnī, despite his old age, had kept clarity, intelligence and vast knowledge, specially of pharmacological sciences besides other matters concerning Indian culture and civilization. In view of his discoveries, George Sarton acknowledged al-Bīrūnī's genius and characterized the first half of the eleventh century as "*The Time of Al-Bīrūnī.*"[20] He regarded him as one of the greatest scientists of Islam, and considered him one of the greatest of all times. All these achievements of al-Bīrūnī earned him the title of '*Al-Ustād*' (The Master) and established his erudition among the mediaeval medical masters. In view of these historical facts, with a quite justifiable pride in his lifeworks and in a rare self-applauding mood, al-Bīrūnī bursts out in Arabic poetry saying thus:

> "By my own efforts I have surpassed the leaders of learning, they have not acquired knowledge as I have done. They have never sat for discussion in so many seats of learning, nor do they indulge in the solution of intricate problems like I do and ask my worth from the Hindus in East, and in the West from those who have assessed the high quality of my work."[21]

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*That vision was the result of information gathered by antennae-like rays emitted by the eye. These rays, striking against an object, were reflected back to the eye, thus conveying to the individual information about the outer world. This information was carried to the brain by a hollow tube (optic nerves) which connects it to the eye.

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(ix) *Va Kitāb tadbiri cum va lailer* (Regimen for day and night) dedicated to Abū Saịd Sharagī.

(x) *Kitab Vasiyatnamo* (A Book of Advice).

(xi) *Taaluk Al sheikhul rais*— (A Book dedicated to Sheikh Rais Ibn Sīnā).[7]

(xii) *Zubda fil ṭibbi* (Cream of Medical Science).[8]

(xiii) *Al-Tazkira al-Ashafuya Sanaat at-tibbiya* (Memorandum Book for Ashraf in Medical Art).[9]

(xiv) *Kitābi Uhra fit ḥikmati* (A Book on Logic).[10]

(xv) *Kitābi fīr Raddi alal falsafadi* (A Book on Philosophy Borders).

The mediaeval historians, Baihaqi and Usaibi'a, testify that Ismāīl Jurjānī lived in the twelfth century on the territory of Khwarazm and was the royal physicain.

The titles of seven books on medicine have been given in Baikhaki's works. In addition, there is information about Jurjānī's works on philosophy and logic. Baihaqi's book could have given us an opportunity to learn valuable data concerning the life and work of Jurjānī, but, unfortunately, some portions of the manuscript obliterated.

Usaybi'a writes that Jurjānī wrote all his works in Khwarazm. He also gives the description of all works of Jurjānī on medicine, their essence, subject-matter and conveys that the physician had formulated in a creative manner, the scientific methods and modes of treating diseases.

Some time later, Nizāmī Árūdī Samarqandi, the author of *a Collection of Rarities or Four Conversations* stated that, along with "Sections" by Hippocrates and "Admonitions" by al-Rāzī, the work by Jurjānī on the "Aims" was recommended for devoted studies.

To acquire knowledge about medicinal herbs, it was recommended to read *Khwarazmshāh's Treasure*, with the other works, viz, "sixteeen" by Galen, "Hundred Chapters" by Masīḥi, "Canon" by Ibn Sīna.[11]

Ábbās Nafīsī dedicates third part of his book, *Medicine of Persia from its Birth up to our Day*, and its theoretical basis according to medical encyclopaedia by Gorgen (Jurjānī) (1933), to the period of Persian Renaissance and Ismāīl Jurjānī's medicine.

Nafīsī divides the history of medicine in Irān into three periods : Islamic, Arab-Persian and Persian Renaissance or Ismāīl Gorgānī (Jurjānī). According to him, Jurjānī was an outstanding scientist of the twelfth century, and his main

work, *Treasure,* along with the works of al-Rāzī and Ibn Sīnā, was the medical encyclopaedia of that time, reflecting vast practical experience as well as deep theoretical knowledge of the author.

Nafīsī did not relate Jurjānī with Ḵhwārazm's culture and considered him to be an Iranian scientist only, and also his medicine to be Persian only for the reason that he wrote his work in Persian.

A modern Iranian scientist, Muḥammad Najimābādī, writes in his article *Islamic Medicine* (an Iranian one in particular) and its influence on European medicine[12] as follows : "....after Ibn Sīnā we are encountered with Jurjānī, one of the famous physicians of Islamic period. Before him, medical books were written in Arabic, but he had written a classic scientific work, *Dhakhirāi Ḵhwārazmshāhīi,* in Persian language, having begun thus a new epoch in Iranian medicine."

The Iranian scientists have not lost interest in the study of Ismāīl Jurjānī's scientific heritage even nowdays. Irazh A peshar and Muhammad Tagi Perhukh, re-edited the first volume of *Ḵhwārazmshāhi's Treasure* in 1965. They have brought Jurjānī's work, which was rewritten by the copyist, Abū Muḥammad ibn Beniman al-Hamadānī in 1333.

According to them, the first book consists of six parts. In the first part Jurjānī spoke about the usefulness and significance of medicine and the aims of a doctor. The second and third parts deal with the definition of human nature, conditions of age, sex, nourishment and individual nature of each person. The methods of identification of normal and abnormal states of nature of different people, and certan organs such as, brain, heart, stomach and liver.

The fourth and the fifth parts are dedicated to anatomy and physiology of individual organs and the systems of human body. In the sixth part, Jurjānī endeavours to identify natural and unnatural forces, which are useful and harmful for the body.

Ismāīl Jurjānī's book was commented upon in the 19th century in Ḵhwārazm, and it remained an essential source for studying medicine in Central Asia. Besides, there were numerous later commentaries of his works. The one by Muḥammad Ḵhudābāhsh, son of Qodi Abū'-i-Fatāḥī, is well known. The work has been brought out in several versions in India; there is two-volume work as well as some commentaries which often had no title. There existed some other manuscripts of Ismāīl Jurjānī which were commented upon even in the nineteenth century. One of them is a shortened variation of his *Ḵhwaruzmshāh's Teasure* written in Uzbek language in Ḵhwārazm.

In the preface, the author (Ismāil Jurjānī) wrote that, just in the thirteenth century, there appeared a necessity for abridging the main work, and thus a shortened version was written with the object of providing persons concerned with a textbook more portable and convenient for use than the voluminous main work. As the commentators have pointed out, the clinical aspects, a course on different diseases and pharmacology, were described well in a popular way. This entire work is divided into two parts : the first devoted to the theoretical, and the second, to medical practice.

The work was written once again by an unknown author in 1826-1827 and, in view of wide range of topics covered therein, this work can be compared with a medical encyclopaedia.

In Jurjānī's opinion medicine is a science of human state, health and disease as well as the means for preserving the health even in the healthy people. Special causes exist which condition health and may cause dieases. When they are contradictory, they turn to be pathogenic. The author's concept represents the generalization in theoretical medicine of that time, where the accent was laid upon an interchange of causes and effects. In some definite conditions, they support health, while, in some different conditions, they result in quantitatively a new state, that is, a disease.

Six factors causing an illness have been enumerated: air (climate), food and drinking, drugs, trade ; sleep and keeping awake ; things entering the body and leaving it ; unusual events that take place inside the body, gaity, melancholy (sadness) etc.

A *ṭabīb* must know the way each person must protect oneself from a disease and prevent the poisonous factors.

The following are the ancient doctrines on the basis of the theoretical view points of Jurjānī and Ibn Sīnā, the structure and functioning of human body; doctrine of cosmic elements; doctrine of pneuma; and humoral theory. Jurjānī asserted that ".... the four elements are the basis of all complex vegetarian and animal substances. They mix and interact until they are not established in a state of mutual balance or predominance" (Jurjani, Book I, p. 17-18). According to this doctrine, any organ (bones, vessels, muscles, tendons, liquid-mucosa, blood, bile etc.) are the result of the synthesis of four elements known to ancient Hindus. Then pointing out the significance of knowledge of these fundamentals, he defines the doctors' aim as consisting of preservation of every person's health, elimination of illness by health-restoring remedies, knowledge of their dosage, time of usage and ways of their administration.

Further, Jurjānī stated that the human body consisted of matter and forms. The matter consists of four aforesaid elements which, in their isolated or separate

forms, have their special qualities. These qualities avoid approaching to each other, and their reapproachment leads to counteraction. The human body consisting of these antagonistic origins or sources is doomed inevitably to death. In the human body every element is connected with each other in a position, but juxtaposed to another element. In this respect, each element aims at separation, but some energy exists that has an attraction force which keeps an element, its matter in position. This energy aims at keeping the matter in the same form, but it does not achieve its aim, because of the fact that it cannot maintain a peaceful state of sources and their entities. Therefore, a man had to take in air, maintain warmth and deal with fire on earth.

Jurjānī has also elaborated upon the need for eating diverse foodstuffs and other aspects of human life in terms of outer circumstances and inner causes.

Jurjānī classified all substances existing in the world into four main groups : (i) those containing the largest quantity of 'fire' component, constituting a group of '*warm*' and 'dry'; (ii) those containing the greatest quantity of 'air' component, constituting a group of 'warm' and 'damp' ; (iii) substances that contained the greatest quantity of 'water' component, forming a group of 'cold' and 'damp' ; and (iv) substances that contained the greatest quantity of 'earth' component, forming a group of 'cold' and 'dry'. In the author's opinion, these four qualities were opposite to each other. Here the author's standpoint was related with the classical works of the ancient Greek material philosophers. The author was also familiar with the works of Hippocrates, Plato, Aristotle and especially Galen. As is well known, Thales considered 'water' to be the fundamental substance, Anaximenes thought it to be 'air' and Heracletus, 'fire'. Jurjānī's viewpoint was the continuation of their philosophy.

Jurjānī noted that these elements, outside the body (that is, in nature) acted against each other. Where there is fire, there is no water; but sometimes they can exist together. For instance, air may contain moisture, air may contain moisture and fire; earth, water and fire, etc. Each element has its 'nature', that is, its quantitative characteristics which can, however, extend 'out of nature limits'. These various elements are not 'harmful' to each other in the body; but if one of them predominates, the normal state will be impaired then. The state of mutual balance (*e' tidal*) is a quantitative category, determined by a definite quantitative proportion of the elements.

Everything that grows develops itself with warmth and cold. From this it is clear that every element has its function and force. If warmth acts in the body, the dryness is formed, if cold acts, then moisture is formed. If moisture acts, cold is formed. It has been surmised that cold and moisture are formed quicker than dryness. Therefore, the elements of dryness begin to influence upon each other, for they are antagonistic in their nature.

Each organ has its own nature different from that of the other organ. Therefore, different organs have different degrees of firmness, softness, heaviness, etc. Therefore, children are born from the parents' 'water'. Both 'waters' are formed out of blood. Everything that is nutrious is from the plants and the meat of animals is also from plants. But the plants grow out of earth due to water. All these consist of four elements. The *mizajis* (nature) can be different. That is why every child has nis own *mizāj* which is like that of its parents. The *tabīb* (doctor) must know what occurs in the body and what it consists of all together (book 1, p. 19-23). Everything mentioned is in support of the fact that Jurjānī, starting from inanimate nature, arrives at animated nature and theoretically proved the material nature of *mizāj* (nature).

In Oriental Medicine, the term 'mizāj' is used meaning 'mixture', 'composition' ('structure'), temperament and, finally, 'nature'. That is why the investigators of *Canon* translate this word into Russian language. The term 'Mizāj', as Ibn Sina used it, is more complex than this scheme. He understood *mizaj* in terms of the ratio of four primary qualities (hot, cold, dryness and moisture), characterising the whole body, as also its different parts, and fluids, drugs, food and climate too.

"I affirm that nature is a quality arising from interaction of opposite qualities, when it stops at some limit. These qualities exist in small particles of elements, and the greater quantity of each element remains in contact with that of the other. When they influence with their forces on each other, out of their aggregation there appears a quality which resembling them, and that is "nature" (Book 1, p. 10).

Further, "There are four primary forces in the elements and they are : warmth, cold, moisture and dryness. In one case nature is balanced if the parts are equal in relation to their mutually opposite qualities, and they oppose each other, so that nature turns to be a quality really mediating between them".

"The second case" is when nature is not the absolute mediator between mutually opposite qualities, but it inclines more towards this or that side in terms of warmth and cold, moisture and dryness" (Book 1, p. 11). *Mizāj* is described by Jurjānī in the following way : It is necessary to know that the basis of all things is water. Each element has qualities called *ṣūrat* and *tabī'at* by *ṭabībs* (doctors), and they oppose each other. As it is known the body (organs) consists of an aggregation of four elements in all human beings and animals, which have opposite qualities. These qualities have influences which the body accepts, as a result of which, the body becomes either useful or harmful. When two opposite qualities influence the body (organ) and, as a result, one of them wins over the other, the one which will be stronger is called *koin* which, in Arabic, means that it has 'formed'. The one which is weaker and this had been won over, is called

posid, meaning a spoiled thing in Persian. If two opposite qualities influence each other equally, such a state is called in Arabic *istikholatata*, meaning 'having changed its state'. As a result of *istikholata* or the change towards the initial position (state) of the two qualities, there arises a state of middle qualities in the body called *mizāj* (Book 1, p. 11).

Jurjānī states that, if two elements have an equilibrium nature, the *mizāj* will be one of equilibrium. If one of elements is stronger and the another is weaker, the *mizāj* is known as "strong". If the warmth and cold are balanced, (*mútadil*) and if dryness predominates, it will be dry *mizāj*. If moisture predominates over dryness, the *mizāj* turns out to be hot. And, finally, if cold predominates over warmth the *mizāj* will be cold. It will thus be observed, that Jurjānī has described simply and distinctly the dynamics and causes of the formation of four kinds of *mizāj*.

Further, he described eight divisions of the unbalanced kind of *mizāj* in a in a simple and easy to understandable way, and at last, as it is with Ibn Sīnā, there follows a statement of the fundamental priniciple viz, blood is formed according one's nature (*mizāj*) in the human body and with this...individuality, distinction in people could be explained.

For this reason, according to Jurjānī, each body and every part (organ) of it, has its specific nature determined with the contents of fundamentals. But, as he asserts, this peculiarity is not invariable. The nature of the body changes with age and each stage has its nature. The latter is hot and moist in childhood; but, as the body grows, moisture is spent and diminishes as age advances, but warmth is not decreased. In the second period of life (maturity), the body nature is hot and dry, that is, a normal mean body state. Heat and moist decrease after the age of 35, and from the age of 60 years onwards, the inherited heat and moisture become less and less. As a result, the strength, spiritual balance, good appetite, intelligence, voice, habits, appearance and complexion are never the same.

Jurjānī has also described the *mizāj* of certain organs, such as brain, liver, stomach and testicles (in six chapters).

We cannot but remark that the enumerated criteria are a further development of the basic statements of Hippocrates on temperaments. The main concept of the dependence of morphological and functional characteristics of the human body is underlined in this criteria. It is easy to see that Jurjānī, like Ibn Sīnā, along with order accessible 'signs', pays substantial attention to "reaction rapidity", condition of actions and "spiritual forces".

It is important to note that one of the main pecularities of oriental medicine is a strictly individualized approach to a patient. The demand for individualized

treatment including the human *mizāj* (the present nomenclature is, organism reactivity) remains relevant even in our days.

As noted before, Jurjānī made a notable contribution to the theory and practice of medicine by compiling a book wherein a *ṭabīb* (doctor) could find easily necessary information about human anatomy and physiology in a systematized manner. He stressed that a deep study of these subjects was essential for any doctor who should spare no pains in understanding not only the causative factors of disease but also the conditions of the patient's life itself, his environment, food habits and the like. Jurjānī did not draw a sharp line between the animate and inanimate world, although he had regarded that the Jaṃadat (world of plants) and jumadat (earth, mountain, salts etc) would be inanimate and the animals was characterised specially by its brain function.

The compendium of Jurjānī is known for its clarity as well as for a wide coverage of subjects including climatic conditions as well as the geographical aspects, and their effect on human body and mental functions. There is no denying the fact that Jurjānī has a distinct place in the history of medicine of the world.

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TECHNOLOGY, ARTS & CRAFTS

TECHNO-CULTURAL CONTACTS BETWEEN INDIA AND CENTRAL ASIA DURING THE PROTOHISTORIC AND EARLY HISTORIC PERIODS

S. R. Rao

Close cultural contacts between Central Asia and India through Afghānistān are now clearly traceable as a result of a number of excavations in Turkmenia, Seistan, Bactria and other regions. The Soviet archaeologists V. N. Masson, V. I. Sariandi and A. Ya. Schetenko, have contributed a good deal to our knowledge of the extension of the Harappan, Late Harappan and post-Harappan contacts as well as the establishment of trading centres in Turkmenia during the last quarter of the third millennium, and throughout the second and first millennia B. C.[1]

Besides studying the rich collection of excavated antiquities in the various museums at Moscow, Leningrad, Tashkent, Samarkand and Bukhara, the author had the privilege of visiting important sites such as Nisa, the ancient Parthian capital near Ashkhabad in Turkmenia and Dijome, an extensive Bronze Age site near Tbilisi in Georgian Republic, in addition to studying the excellent collection of antiquities from the Bronze Age sites of Namazga Depa, Altin Depa, Ak Depae and Ulugh Depe in Turkmenia. A steatite seal with a swastika motif and inscription in linear Indus script of Late Harappan times without any animal motif occurs in Altin Depe. Further southeast of Altin Depe is the Harappan site of Shortughai in Afghānistān which was another important mature Harappan settlement. The seal from Shortughai bears the motif of rhinoceros drawn in typical Indus style and the two Indus signs inscribed above it namely, the socalled "fence" sign and a linear sign are reminiscent of the mature Harappan writing. Further southward are the Harappan settlements of Rehman Dheri in Pakistan and Harappa in India. Shortughai is a well-planned town of mature Harappan times and the importance of Altin Depe lies in the fact that it is an urban settlement of the Late Harappan times indicating the continuance of Harappan traditions not only in the ceramic wares, writing, metal wares and beads but also in the provision of civic amenities. The decline of Harappa culture is gradual in Turkmenia whereas it is rather accelerated in the Indus Valley, Harayana, Rajasthan and Gujarat.

The Harappan ceramic types such as the cylindrical perforated jar, carinated dish-on-stand and cylindrical vase with flat base, leaf shaped copper spearheads etc., occur in Namazga V and corresponding period of Altin Depe.

Urban settlements of considerable size were established in Turan even before such urban centres came into existence in the Indus Valley.[2] Complex class strati-

fied societies are indicated by monumental architecture and craft-specialization in outer Iran before and during Harappan times, making it possible for exchange of ideas and goods in the pre-Harappan and Harappan times. In the case of South Turkmenia the exchange of goods and ideas began in the later phase of Harappa culture (2000 B. C.) and continued for a longer period in Late Harappan times. Anau is another Bronze Age site in Turkmenia where copper and bronze tools, weapons and ornaments of Harappan affinity occur. Particular mention may be made of leaf shaped knives, concave sickles, surgical fod with budshaped ends, dagger and spearheads without midrib from Anau as well as copper frying pan, Carnelian beads, disc-steatite beads and barrel shaped gold beads from Altin Depe. Parallel-sided blades of chert and agate from both these sites are produced in the Harappan technique of "Crested guiding ridge". Terracotta carts with solid wheels, ivory rods and inlays and terracotta male figures of Central Asia are analogous in technique and form to those of Lothal and Harappa. The cult of Mother Goddess was popular in the Indus Valley as well as Turkmenia in the early centuries of the second millennium B. C. But there is some stylistic difference between the Indus figures which are noted for their applique decoration and those of Altin Depe characterised by scooped decoration. The similarity in the anatomical contours from Central Asia and Indus Valley deserves mention. The analogy between Indus and Turkmenian sites can be extended to other knicknacks like beads of terracotta and semiprecious stones, cubical stone weights of agate and chert and wafer beads of steatite.

The most distinct Indus motif occurring on the seal from a grave in Altin Depe is the three-headed animal motif. All the three heads represent the tiger in Altin Depe whereas, in the Indus seals of Mohenjo-daro, Harappa and Kalibangan, different animals are represented, e.g., bull, unicorn and unicorn, or bull, unicorn and goat. The *swastika* occurring on Altin Depe pottery is another motif which is reminiscent of techno-cultural contact with the Indus Civilization in Gujarat, Indus Valley and Rajasthan.

From a study of the Turanian and Turkmenian Bronze Age sites two noteworthy features emerge. First, some of the basic concepts of the mature Harappan culture are traceable to the already urbanized settlements of outer Iran. Secondly, there seems to be a northeastward movement of the Harappans in the days of cultural decline in the early centuries of the second millennium B. C., but the substratum of Harappan tradition is found to be stronger in Turkmenia than in Gujarāt or Haryana in the Late Harappan times. Philip Kohl observes : "Such features as monumental architecture and full time craft specialisation strongly suggest the existence of complex class-stratified societies in outer Iran prior—on present evidence—to their unmistakable occurrence during Harappan times. Later evidence during the Harappan period for extensive contact between Central and South Asia most likely implies the existence of earlier exchanges of materials and ideas that must have influenced developments in both areas".[3]

The Indus Valley civilization must have exchanged ideas and equipment with outer Iranian sites. One such idea is fire-worship, another being monumental architecture. The fire-altar on more than a thousand Indus seals shows greater affinity with the Iranian fire altar than with the Vedic altar. While borrowing from outer Iranian (Turan) religious concepts such as fire-worship which ultimately supplimented other faiths including animal-worship, the Harappa culture evolved its own personality in the fertile plains of the Indus and achieved the highest degree of cultural, political and social integration as reflected by the homogenity of material remains in and beyond the Indus valley. Its distinctive contribution to progress of man in evolving a simplified linear script and other fields is already well known (Rao 1973, 1979, 1984). The Bronze Age sites of Turkmenia retained certain Harappan traditions of lasting value. So far as Shortugai in Afghanistan is concerned it is now obvious from the excavated finds[4] of Period I that there was a well entrenched Harappan establishment not merely for purpose of trade but also for exploiting or controlling the mineral resources. Besides metal and ivory artifacts, pottery and seals of Harappan origin found in Shortughai I, the graveyards of Bactria have yielded Indus seals and etched carnelian beads thus confirming the importance of Bactria on the trade routes between Central Asia and Indus Valley[5] while Namazga V was contemporary with mature Harappa Culture and its late phase also, the Bactrian evidence shows further survival of some Harappan traditions comparable to post-Harappan Jhukar material from Sind.

The recent underwater excavations in Bet Dwarka in Saurasthra have yielded evidence of contact with Bahrain in the Harappan and Late Harappan periods. The three-headed animal motif on the shell seal of Bet Dwarka is drawn in Bahrainian style (see Plate I). The Kassite ware found here suggests contacts in the post-Harappan period. It may be recalled that circular seals with Indus script and motif occur in the Bronze Age graves of Bahrain. Some later graves have yielded evolved Late Harappan ceramic ware, and some Lustrous Red Ware vessels are also encountered.

According to Tosī, Tūrān extended from Damghan plain in North-Central Iran and Turkmenia in the north to the Helmand Valley in the south. Kohl disagrees with Tosī in lumping four distinct cultural regions into one under Turan. though he admits that Turan was not a cultural backwash as evidenced by urban settlements of Shahr-I-Sokhta, Namazga Depe, Altin Depe and Mundigak. The diversity in the cultures of Turan is in contrast with the homogeneties of Indus Civilization. Be that as it may, cultural interaction between outer Iran and Indus Civilization cannot be denied.

Dales has drawn attention to the archaeological parallels between pre-Harappan (Early Indus of Mughal) cultures and Mundigak IV, Bampur IV, Namazga IV and Susa D based on corrected Carbon 14 dates[6] which tend to suggest indigenous development of the Indus Civilization from antecedents in



Plate I Indus type sealwith a three-headed animal engraved in Bahrinian style=from underwater excavation off Bet Dwarka, circa 15th cent B.C.

Afghānistān and Baluchistan. The contribution of Turan including South Turkmenia is also a factor to be taken into account.

Among the other Central Asian Bronze Age sites of the now Soviet Central Asian region which had contacts with India in the Harappan and post-Harappan periods, mention should be made of Zamanbaba (Bukhāra) near Amu-Darya north of Anau where disc steatite, and faience, beads of barrel shape and incised Grey Ware recalling those from Harappa Khazazm in Uzbekistan is an important site where joint burials of children are encountered in the bronze age graves. The Fargana Valley has much to offer by way of comparison of craftsman's tools of Late Bronze Age with those of the Late and post-Harappan periods in India. For instance at Chust conical stone objects with a spheriod top resembling the gamesman of Lothal, maceheads, loom weights, weaver's spindle whorl of terracotta and comb like tools of bone are comparable to their Indian counterparts. A bronze mirror of 1st-2nd millennium B. C. socketted bronze axe of the Lothal type and socketted arrowhead assignable to the first millennium B. C. are found in Surkhan Daria. Similar mirror occurs in Lothal and the arrowheads occur in the post-Harappan Chalcolithic sites elsewhere in India. *Sati*-like burial of 1st-2nd century A. D. covered with cairn-like tumulus is a significant funerary practice in Chust. The *S*cythian sites of 6th-4th century B. C. in Parthia and Sogdiana reveal cultural contacts with India. Elephants are depicted on Greeco-Bactrian coins etc. It is interesting to find that the fire worshipping scythians deposited the bones in the hollow part of terracotta figures. By 1st century A. D. Kharoṣṭhī inscriptions are found in Uzbekistan and Kuṣāṇa stone freizes of Buddhist faith also occur here.

In Firmuz and Balalak Tepe, the murals of the 4th-5th century A. D. and the carved wooden pillars of Aburdan in Palmyra (Tādjikistān) show distant affinity in respect of the Indian motifs depicted therein.

The pre-Arab 7th century stone sculptures of Varakshah near Bukhāra have a distinct style : the mudbrick columns of the fort of this town are unique in construction. The walls of the palace within the fort are decorated with terracotta bricks carved with geometric and floral patterns. Large terracotta Buddhist figures of Buddha are among the noteworthy sculptures of 7th-8th century A. D. at Kubah in Fargana. The influence of Buddhism is the most noteworthy feature here.

The murals of Pandjkent near Tashkent (7th-8th century A. D.) depict scenes from *Shāh Nāma*.

The close cultural, political and religious affinities between India and central Asia from 11th century A. D. onwards is well known.

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CORRECTIVE CORRELATIONS OF METALLIC IMPURITIES CONTENT OWING TO TIME LAPSE RELATING TO COPPER COINS OF KUSHANA RULERS

S. V. LEVUSHKINA AND A. A. ZHIVETIN

In its time, the Empire of Kushana included the region now comprising Uzbekistān, Tādjikistān, Afghānistān and Northern India and, hence the Kushana currency was in circulation not only in India but in Central Asia as well.

For research workers who are engaged in matters relating to history of this empire, an information of extreme value can be gleaned from the multilateral study of coins of the region since the analyses of valid currencies of those days may well supply the most essential data not only with regard to the local raw materials—resources as well as the standards of development of metallurgical industry but also they reflect the possible trends of various economic reforms which occured in the Empire.

Thus, on the initiative of Prof. G. A. Pugachenkova, in the laboratory of Scientific Arts Restoration of the Hamza Institute of Art History, an extensive research work was carried out for establishing the elemental composition of the coins of both the Kushana and post-Kushana dynasties pertaining to the period, 2nd century B. C. to 4th century A. D. which were discovered in the course of exavations undertaken by the Uzbek Arts History and Baktrian Archaeological expeditions at the sites of the old monuments and relics in the Surkandarya district of Uzbekistān.

A systematic study was made concerning more than two hundred coins, including Uegian imitations of the Helioclus coins (the so-called "Barbarian Helioclus") as well coins of the Kushana dynasty of Soter Magas, Kadfiz II Kaṇiṣka I, Khuviṣka, Vasudeva I, Vasudeva II, Kaṇiṣka III (coins that imitate the mintage principles of Vasudeva I and Vasudeva II—Kaṇiṣka III periods) for purposes of comparison, a number of Kushana-Sassanid period coins minted in the 3rd-4th centuries A. D. were examined and a complete chemical composition of Kushana coins has been published in the *Catalogue of Ancient Coins of South* Uzbekistan[1].

Results of these research works proved that, inspite of the wide-spread existing opinion, the majority of the Kushana period coins were minted out not of pure copper, but out of bronze and, as a specially interesting and hitherto unknown factor, we should point out that in the minting processes of Vasudeva II—Kaṇiṣka III coins made of brass appeared and were circulated widely as, for example, in the

Roman currency system as far back as from the days of Augustus. Results of the analyses are given in Tables I-X. The basic metal of these alloys was copper, while the contents of metallic impurities varied throughout the whole period. These were studied. The compositions indicate nearly thirty different chemical names, and the impurities of some of these (silicon, calcium, magnesium, aluminium) were attributed by us as a deliberate inclusion of a group of rock-forming minerals. Hence, the presence of such impurities in the smelted metal only characterises to a certain degree the well developed technical equipment as well as the high standard of professional know-how of the metallurgists of the ancient period.

The presence in the metal of an admixture of silver, bismuth and nickel was likewise attributed their accompanying copper in the ore itself. The content of iron may likewise be attributed to a number of unintentional impurities associated not only with the conditions of copper smelting processes of those days but also with the actual degree of exploitation of raw material resources. Inclusion of substantial quantities of iron into the composition of copper-yielding ores testifies to the fact that, instead of the sulphide raw materials, the pyritic ores from the worked-out deposits of smelting of copper proved to be a far more labour-consuming process, and this called for novel professional know-how and new implements of production.

However, the presence in copper alloy of fixed contents of such rare elements like zirconium, scandium, gallium and germanium would characterize only one specific ore deposit, just like a strict individuality of one's fingerprints. Nevertheless, so far as the actual content of the aforementioned metals in the coins greatly differentiates, we do not consider it as absolutely essential to compare the compositions of the ore deposits and those of coins under review and the main reasons for this will be explained in detail later.

The presence of impurities in copper alloys, like arsenic, antimony, tin, lead and zinc, is regarded as a decisive criterion for the characteristics of an alloy and apportioning it either to metallurgically pure copper, or to bronzes or brass groups, even in such small contents as were detected in the coins of Kushana period. Variability in content of such chemical elements from time to time in the background of natural impurities of various other metals in reality was the principle objective of conducting this particular investigation.

Minutest study of elemental composition of these coins disclose a certain type of conformity in the variability of the constitution of alloys in course of a consecutive transition of various coins from the early Kushana rulers to those of the later periods. In the coins of the "Barbarian Helioclus" as well as of Soter Megas, one can observe distinctly a strongly noticeable variation in the content of elements which fluctuated from the integer values right down to hundredths of a value and, in certain cases, to thousandth part of their percentage even in the minted coins of one and the same ruler.

However, in the minted coins of rulers of later periods such a type of variability has not been observed and, with the period of Kadfiz II, a more or less well regulated compositions of alloys were recorded and, judging by the analytical results, we may infer that, during the reign of Kadfiz II, monetary units were subjected to a number of reformations and this found its subsequent reflection in the elemental compositions of metal.

All the monetary alloys of the Kushana dynasty that were subjected to analytical tests, were classified into separate groups with reference to the similarity in their chemical impurities content which are so typical as far as bronzes are concerned and, in accordance with this particular principle, the content of metals in the Kushana coins (Tables 1-8) is subdivided into eight groups.

First group (Table 1) : By way of impurity in the alloy, are cobalt, arsenic, antimony, tin and partially traces of molybdenum. This collection included mainly the coins of Soter Megas (eight pieces) and two coins of the Khuviṣka period. As a rule, coins of the Soter Megas period contain four elements as impurities, vix, antimony, arsenic, cobalt and tin.

Second group (Table 2) : Here the impurities are arsenic, tin, cobalt, molybdenum. This group included two coins of the "Barbarian Helioclus", viz, one of Soter Megas, seven of Kadfiz II and two of Kaṇiṣka I period.

Third group (Table 3) : By way of admixtures with copper, are arsenic, cobalt and tin. This particular group is far more extensively represented as it includes three coins of the "Barbarian Helioclus" period, one of Soter Megas, ten of Kaṇiṣka I, four of Khuviṣka and Vasudeva I of each period individually, and five coins of the Vasudeva II—Kaṇiṣka II dynasty.

Fourth group (Table 4) : As in the previous group, three elements of impurities were noticed, viz, arsenic, cobalt and molybdenum as well as the already mentioned third group of impurities of arsenic and cobalt. Instead of tin, molbdenum was added approximately in exactly the same quantity. This group includes one coin each of Barbarian Helioclus, Soter Megas and Khuviṣka periods, two coins of Kadfiz II and three of Vasudeva I period.

Fifth group (Table 5) : In this are only two elements of impurities i. e., arsenic and cobalt. This group includes one coin of the "Barbarian Helioclus", five coins of Soter Megas, two coins each of Kadfiz II, Kaṇiṣka and Khuviṣka dynasties as well as seven coins of Vasudeva I.

Sixth group (Table 6) : This group of coins contains impurities of tin and cobalt and includes several coins of the composition of which even cobalt is untraceable. This group comprises one coin of the "Barabarian Helioclus", period, four of Vasudeva I and five of Vasudeva II—Kaṇiṣka III periods.

Table 1—Coins of Kushana rulers according to the similarity in impurities composition (basis—copper; first group), %

Location	Pb	Zn	Co	Sb	Mo	Sn	As	Ruler
Bharat-tepeh	0.08	0.02	0.3	0.01	—	0.03	1.0	Soter Megas
Dalverzin-tepeh excavation 1	0.03	0.007	0.001	0.03	—	0.005	0.03	-do-
-do- excn 2	0.03	0.02	0.03	0.03	—	0.04	2.0	-do-
-do- excn 6	0.01	0.007	0.07	0.03	—	0.02	0.7	-do-
-do- excn	0.01	0.01	0.1	0.01	—	0.03	0.7	-do-
-do- excn 9	0.03	0.07	0.3	0.04	—	0.04	2.0	-do-
Yalangtoosh-tepeh	0.01	0.02	0.5	0.01	0.0005	0.001	1.0	-do-
Dalverzin-tepeh excavation 9	0.01	—	0.07	0.01	—	0.02	0.5	-do-
Hatyn-rabad	0.03	0.009	0.007	0.01	0.0005	0.007	0.05	Khuviṣka
Dalverzin-tepeh excavation 11	0.02	0.007	0.005	0.01	—	0.0007	0.01	-do-

Table 2—Coins of Kushana rulers according to similarity in impurities composition (basis – copper; second group), %

Location	Pb	Zn	Co	Sb	Mo	Sn	As	Ruler
Dalvazar-tepeh, excavation 2	0.003	0.07	0.07	—	0.0005	0.0005	0.5	Imitat. Helioclus
Shor-tepeh	0.007	0.007	0.01	—	0.0007	0.001	0.03	-do-
-do-	0.001	0.02	0.05	—	0.0007	0.0005	0.3	Soter Megas
Hatyn - rabat	0.001	0.05	0.1	—	0.0007	0.0007	0.5	Kadfiz II
Bharat-tepeh	0.001	0.04	0.4	—	0.009	0.0007	0.5	-do-
Dalverzin-tepeh excavation 2	0.001	0.1	0.1	—	0.001	0.007	0.5	-do-
-do- excn 1	0.001	0.04	0.3	—	0.007	0.0007	0.9	-do-
-do- excn 2	0.003	0.05	0.1	—	0.001	0.0005	0.4	-do-
-do- excn 6	0.002	0.04	0.4	—	0.002	0.0007	0.7	-do-
Dalverizin-tepeh	0.001	0.03	0.7	—	0.001	0.0005	0.1	-do-
Denau	0.001	0.01	0.4	—	0.003	0.0005	0.3	-do-
Khul-tepeh	0.003	—	0.005	—	0.0009	0.001	0.08	Kaṇiṣka

Table 3—Coins of Kushana rulers according to similarity in impurities composition (basis — copper; third group), %

Location	Pb	Zn	Co	Sn	As	Ruler
Haitabad	0.001	0.007	0.1	0.0007	1.0	Imit. Helioclus
Batyrabad	0.3	0.07	0.07	0.5	0.5	Soter Megas
Dalverzin-tepeh excavation 2	0.004	0.007	0.001	0.0005	0.01	Kaṇiṣka
Yalpak-tepeh	0.003	0.007	0.003	0.0005	0.03	-do-
Bharat-tepeh	0.001	0.007	0.005	0.0005	0.03	-do-
Hatyn–rabat	0.002	—	0.001	0.0005	0.04	-do-
-do-	0.001	—	0.007	0.0005	0.03	-do-
Dalverzin-tepeh excavation 11	0.002	—	0.001	0.0007	0.03	-do-
Yalpak– tepeh	0.002	—	0.007	0.0005	0.03	-do-
Dalverzin-tepeh excavation 11	0.001	0.007	0.004	0.0005	0.01	Khuviṣka
-do- 5	0.001	—	—	0.0005	0.01	-do-
Nazarbaba-tepeh	—	0.007	0.001	0.0005	0.01	Vasudeva 1
Yalpak-tepeh	0.001	0.02	0.007	0.0005	0.01	-do-
-do-	0.002	—	0.005	0.0005	0.03	Vasudeva II—Kaṇiṣka III
Taragai-tepeh	0.003	—	0.005	0.0005	0.01	-do-
Djahdavliat-tepeh	—	—	0.005	0.0005	0.01	-do-

Table 4—Coins of Kushana rulers according to similarity in impurities composition (basis—copper; fourth group), %

Location	Pb	Zn	Co	Mo	As	Ruler
Dalverzin-tepeh excavation 6	0.009	—	0.007	0.0005	0.1	Imit. Helioclus
-do- excn 9	—	0.01	0.1	0.001	0.1	Soter Megas
-do- excn 21	0.001	0.3	0.04	0.001	1.0	Kadifiz II
Shurob-kourgan	—	0.01	0.07	0.005	0.5	-do-
Dalverzin-tepeh excavation 5	—	0.05	0.03	0.001	0.1	Khuviṣka
-do-	0.001	—	0.001	0.0005	0.01	Vasudeva I
-do-	0.0001	—	0.001	0.0005	0.01	-do-
-do-	0.001	—	0.001	0.0005	0.01	-do-

Table 5—Coins of Kushana rulers according to similarity in impurities composition (basis—copper; fifth group), %

Location	Pb	Zn	Co	As	Ruler
Talashkan-tepeh	0.001	0.02	0.01	0.04	Imit. Helioclus
Kampyr-tepeh	0.001	0.07	0.07	0.05	Soter Megas
Bharat-tepeh	—	0.04	0.09	0.05	-do-
Yalpak-tepeh	0.001	0.03	0.03	0.1	-do-
Aisaryh-tepeh	—	0.05	0.03	0.2	-do-
Akkourgan	0.005	0.05	0.01	0.1	-do-
Yalpak-tepeh	0.001	0.03	0.09	0.5	Kadifiz II
Yalangtush-tepeh	0.001	—	0.005	0.01	-do-
Bharat-tepeh	0.001	—	0.001	0.03	Kaṇiṣka I
Hodjakiya	0.001	—	0.001	0.03	-do-
Talashkan-tepeh	0.002	—	0.003	0.03	Khuviṣka
Hatyn-rabat	0.009	—	0.004	0.01	-do-
-do-	0.002	0.007	0.003	0.03	Vasudeva I
Yalpak-tepeh	—	0.007	0.005	0.03	-do-
-do-	0.001	0.007	0.007	0.01	-do-
-do-	0.001	—	0.001	0.03	-do-
Dalverzin-tepeh excavation 6	—	—	0.007	0.01	-do-
-do- excn 1	—	0.009	0.004	0.03	-do-
Taragai-tepeh	0.001	—	0.001	0.01	-do-

Table 6—Coins of Kushana rulers according to similarity in impurities composition (basis—copper; sixth group), %

Location	Pb	Zn	Co	Sn	Ruler
Hatyn—rabat	0.007	0.009	0.007	0.0005	Imit. Helioclus
Yalpak-tepeh	—	0.009	0.004	0.0005	Vasudeva I
-do-	0.002	—	0.004	0.0005	-do-
Bharat-tepeh	0.001	0.05	0.005	0.0005	-do-
Yalpak-tepeh	0.002	0.01	—	0.0005	-do-
Djaidavliat-tepeh	0.001	—	0.005	0.0007	Vasudevea II—Kaṇiṣka III
Bharat-tepeh	0.001	—	0.004	0.0005	-do-
Yalpak-tepeh	0.001	—	0.003	0.002	-do-
-do-	0.03	0.1	—	0.0005	-do-
-do-	—	—	—	0.0005	-do-

Table 7—Coins of Kushana rulers according to similarity in impurities composition (basis—copper; seventh group), %

Location	Pb	Co	Mo	Ruler
Bharat-tepeh	—	0.001	0.0005	Khuviṣka
Dalverzin-tepeh excavation 6	—	0.001	0.0005	Vasudeva I
Yalpak-tepeh	0.002	0.003	0.0005	Vasudeva II-Kaṇiṣka III
Hatyn—rabat	—	0.003	0.0005	-do-
Khul-tepeh	—	—	0.0005	-do-
Dalverzin-tepeh excavation 6	—	—	0.0005	-do-
-do-	—	—	0.0005	-do-

Table 8—Coins of Kushana rulers according to similarity in impurities composition (basis—copper; eighth group) %

Location	Pb	Zn	Co	Ruler
Kampyr-tepeh	0.001	0.05	0.008	Soter Megas
Yalpak-tepeh	0.001	—	0.1	Kadfiz II
Bharat-tepeh	—	0.007	0.001	Kaṇiṣka I
-do-	—	—	0.001	-do-
Hatyn-rabat	0.001	—	—	-do-
Yalpak-tepeh	0.001	0.007	—	Khuviṣka
-do-	0.001	—	—	Vasudeva I
-do-	0.001	—	—	-do-
-do-	0.001	—	—	-do-
Ak-tepeh	—	—	—	-do-
Yalpak-tepeh	0.001	0.009	—	-do-
Ismail-tepeh	—	—	—	-do-
Yalpak-tepeh	—	0.007	—	-do-
Dalverzin-tepeh excavation 6	—	0.007	—	Vasudeva II—Kan. III
Yalpak-tepeh	0.003	—	—	-do-
-do-	0.003	3.0	—	-do-
-do-	0.001	—	—	-do-
Dalverzin-tepeh excavation 6	—	—	—	-do-

Seventh group (Table 7) : The coins of this group contain two impurities, viz., molbdenum and cobalt. Instead of arsenic and tin (see groups 5 and 6, here) we have come across molbdenum and, just as in the preceding group, there are certain singular coins without any visible traces of cobalt. This group includes

one coin each of Khuvişka and Vasudeva I periods and five of Vasudeva II—Kaṇişka III dynasties.

Eighth group (Table 8) : This group by and large consists of coins which contain no impurities in their composition whatsoever, which are so typical of bronzes, the varieties of which are referred to in the earlier mentioned groups. Here we noticed coins which contain a singular impurity of cobalt and, as such, coins of this particular group may well be considered as having been minted out of metallurgically pure copper. They include one each of Soter Megas, Kadfiz II and Khuvişka periods, eight coins of Vasudeva I and five of the Vasudeva II—Kaṇişhka III dynasty and yet another coin with a 3% admixture of zinc with copper which is regarded as quite typical of coins minted from alloys of much later periods, comprising a mixture of copper and brass.

In the eight groups which have been cited above, we observed that the monetary alloys, were distributed ın conformity with the level of decrease in their composition of a number of impurities which are so natural in the case of bronzes. The first group contains all the five elements of the earlier enumerated impurities, while the eight group contained none at all. The initial groups mainly included coins of Kushana rulers of the earlier periods and, in accordence with the reduction of quantity of impurities of these groups, there was a proportionate increase in the number of coins that were minted at later dates. As is well known, for minting of coins of Kushana period, a three-component bronze was employed principally in various admissible variations, while those of the later Kushana period, consisted mainly of nearly pure copper. There is even a single specimen of the Vasudeva II—Kaṇişka III period, which was made out of brass. Nevertheless, the use of different types of brass in the production of various kinds of decorations and adornments has been recorded even in the earlier periods.[2]

Thus, we have arrived at the preliminary conclusion that (i) the monetary alloys of Kushana period make their appearance and subsequently become deep-rooted novel types of recipes of metallurgical bronzes; and (ii) the transition from these bronzes to different types of brasses passed along the following path—arsenious bronzes, stanniferrous and molbdenuous bronzes, pure metall of copper and brass.

As perceived by a large number of historians, the succession of different Kushana kings, viz. Soter Megas, Kadfiz II, Kaṇişka I, Khuvişka, Vaṣudeva I and Vasudeva II—Kaṇişka III, is generally reiterated by the analytical results of chemical compositions of monetary alloys of these kings and falls within the scope of the above mentioned metamorphic bronze series of brass.

On the other hand, such a situation does not signify in the least that each Kushana ruler was able to mint his coins in conformity with a composition of his

own and that, in accordance with the available composition, one could arrive at an exact conclusion as to the actual date of minting, since each new formula took its derivations within the framework of the preceding one and, as such, coins of one ruler could be minted in accordance with different recipes.

In order to reiterate or to disprove the above facts, we have deemed it as absolutely necessary to make use of far more precise mathematical methods of locating the correlative relationships and, specifically in this instance, we reverted to a widely disseminated method of applying the principles of the least permissible squares.

In order to make these calculations, in each of the coins that were subjected to the minute scrutinization, we took into account the content of five different elemental impurities, viz., arsenic, tin, molbdenum, lead and zinc, and linear dependencies were estimated (of the $ax + b = y$) relating to the content of each metal in respect of its period or duration according to the following formula :

$$a = \frac{\sum_{i=1}^{n} X_iY_i - \sum_{i=1}^{n} Y_i \sum_{i=1}^{n} X_i/n}{\sum_{i=1}^{n} X_i^2 - \frac{\left(\sum_{i=1}^{n} X_i\right.}{n}} .$$

$$b = \frac{\sum_{i=1}^{n} Y_i - \sum_{i=1}^{n} X_i Y_i . \sum_{i=1}^{n} \Big/ \sum_{i=1}^{n} X_i^2}{n - \left(\sum_{i=1}^{n} X_i\right)^2 \Big/ \sum_{i=1}^{n} X_i^2}$$

Where X = is the ordinal number of the ruling king (period);

Y = content of specific metals (in %) in the coins of the respective ruler; and

n = number of coins investigated.

Besides the coins of the Kushana period, we have made use of the analytical or chemical composition of the post-Kushana coins that imitate the minting methods of Vasudeva I and Vasudeva II as well as several specimens of the Kushano-Sassanid ones (Tables 9 and 10).

The graphical dependencies so obtained are cited in Fig. 1, from which it may be observed that the variations in metal contents of coins are governed by certain regulations. A beam of straight curves, marked by a dotted line, characterizes the relationship of contents of individual impurities of different metals depending upon the time factor for the coins minted by Kushana rulers, while a beam of straight curves, marked by one continuous line, characterizes the depen-

Table 9—Composition of impurities in coins imitating minting methods of Vasudeva I (basis-copper)% found during excavation works at Zar-tepeh*

Sl No.	Pb	Zn	As	Co	Mo	W	Sn
1.	0.01	0.006	0.08	0.006	—	0.01	0.03
2.	0.001	0.006	0.02	0.003	—	—	0.001
3.	0.001	0.008	0.02	0.008	—	0.01	0.001
4.	0.003	0.007	0.01	—	—	—	0.0007
5.	0.001	0.006	0.03	—	—	—	0.0007
6.	0.002	0.06	0.03	0.01	0.003	—	0.005
7.	0.001	0.07	0.01	0.003	—	—	0.002
8.	0.001	0.007	0.01	0.001	0.001	0.02	0,006
9.	0.001	0.007	0.01	0.001	0.001	0.01	0.0007
10.	0.001	0.01	0.01	0.003	—	0.01	0.0005
11.	0.002	—	0.03	0.003	—	—	0.002
12.	0.001	—	0.01	0.01	—	0.01	—
13.	0.003	—	0.03	0.006	—	0.01	0.001
14.	0.C01	—	0.01	0.004	—	0.01	0.0005
15.	0.001	—	0.02	0.C01	—	—	0.001
16.	0.001	—	0.01	0.005	—	—	0.0005
17.	0.001	—	0.01	0.001	—	—	0.0007
18.	0.01	—	0.04	0.01	0.001	—	0.09
19.	0.001	—	—	—	0.001	0.01	0.0008
20.	0.001	—	—	0.004	—	—	0.0009
21.	0.001	—	—	0.001	—	0.01	0.0006
22.	—	0.03	—	0.001	—	—	0.0005
23.	—	—	—	0.003	—	—	0.0005
24.	—	—	—	0.003	—	—	0.002

*Authors express their sincere gratitude to archaeologist Sh. R. Pidaiyev for the coins he provided us for conducting analytical and research work in this particular field.

dency of the content of monetary alloys in relation to their time factors for the entire lot of coins jointly analysed, viz., Uegenian, Kushana, post-Kushana and Kushano-Sassanid ones. In the accompanying diagram, it is clearly illustrated that straight curves, depending upon the composition-time factor relationship in respect of Kushana coins are drawn far more sharply, than similar curves that are related to all the remaining coins jointly taken This only testifies, that, at the time, the development of metallurgic copper alloys in the Kushana period that were used for minting purposes, progressed far more intensively, while the temporary variations in monetary compositions, imitating the late Kushana methods of minting, were quite insignificant. It is of a particular importance that the relationships in respect of variation in content of different metals from actual time-factor were subjected to identical laws within the specific groups and this is indicated in a diagram in the form of a pair of clearly expressed beams of curves.

Table 10—Composition of impurities in coins imitating minting methods of Vasudeva II—Kaṇiṣka III (basis-copper in %) found during excavations at Zae-tepeh.

Sl No.	Pb	Zn	As	Co	Sn
1.	0.001	0.006	0.02	0.003	0.001
2.	0.001	0.006	0.02	0.002	0.0008
3.	0.001	0.03	0.01	—	0.0007
4.	0.001	0.01	0.01	—	0.0007
5.	0.005	—	0.01	0.003	0.0006
6.	0.001	—	0.01	0.001	0.0005
7.	0.001	—	0.02	0.003	0.0006
8.	0.001	—	0.01	0.001	0.0005
9.	—	0.01	0.01	—	0.0007
10.	—	0.006	—	—	0.0006
11.	—	0.006	0.01	0.003	0.0007
12.	—	—	0.01	0.001	0.0005
13.	—	—	0.01	0.001	0.0006
14.	—	—	0.01	0.001	0.0006
15.	—	—	0.01	0.003	0.0005
16.	—	—	0.01	—	0.0006
17.	0.001	0.006	—	0.001	—
18.	0.001	0.006	—	0.004	—
19.	0.001	—	—	0.001	0.0006
20.	0.001	—	—	0.001	—
21.	0.001	—	—	0.003	0.0005
22.	0.001	—	—	0.001	—
23.	—	—	—	0.001	0.0008
24.	—	—	—	—	0.0006

With a view to evaluating the reliability of apportioned relationships between composition and the time-factor, we have computed the coefficient of correlation for arsenic according to the following formula :

$$R = \frac{\sum_{i=1}^{n} (Xi - Xcp).(Yi - Ycp)}{\sqrt{\left[\sum_{i=1}^{n} (Xi - Xcp)^2\right]\left[\sum_{i=1}^{n} (Yi - Ycp)^2\right]}}$$

where $$Xcp = \frac{\sum_{i=1}^{n} Xi}{n}; \quad Ycp = \frac{\sum_{1}^{n} Yi}{1}$$

Of all the elements enumerated earlier, we chose arsenic, because due to its presence in the copper alloy, it is expected to establish the exact dates of copper-containing alloys[3].

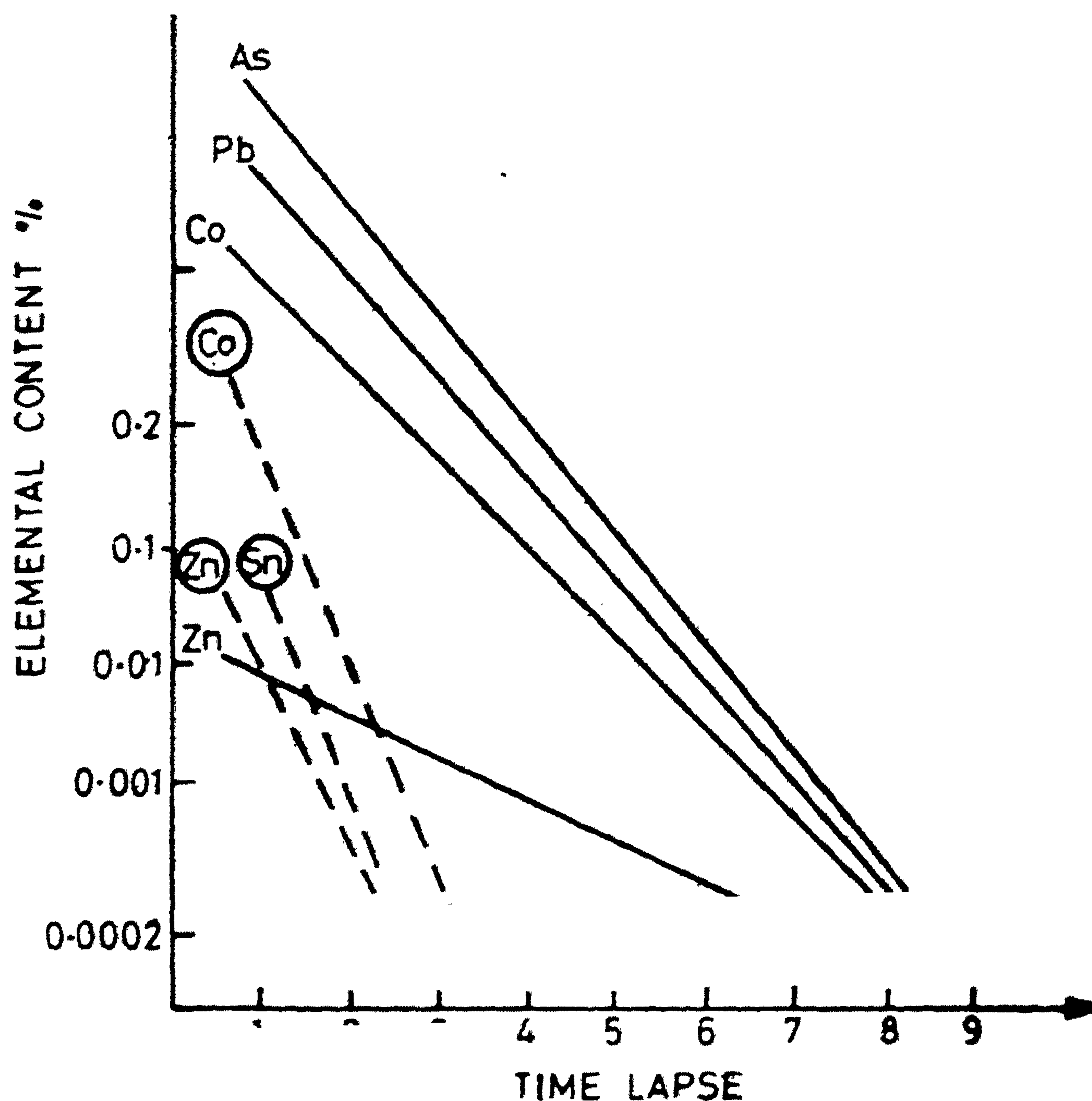


Fig. 1. Graphical diagram showing compositional relationship of separate impurity elements depending upon time lapse in copper alloy coins of Kushana rulers, where : I–Barbarian Helioclus"; 2–Soter Megas; 3–Kadfiz II; 4–Kaṇiṣka I; 5–Khuviṣka; 6–Vasudeva I; 7–Vasudeva II — Kaṇiṣka III; 8–imitations of Vasudeva I; 9–imitations of Vasudeva II Kaṇiṣka III—. Continuous (unbroken) line—elemental content of impurities in all the coins that were investigated. Dotted (broken) line—volume of impurities detected in coins of Kushana period.

The coefficient value of correlation for the coins of Kushana origin proved to be equal i.e., 0.73 and drops down to 0.2 in the case of all the Kushana coins taken together and which tend to imitate the late Kushana methods of minting.

Now let us review the point of possibility of varying the content of separate elements in different coins on the basis of changing deposits of ore-bearing resources.

Originally we considered it as essential to make a comparison of the contents of metals in areas of ore-bearing deposits as well as in the coins with a view to solving the problems of inclusion of deliberate impurities. We even collected the analytical data on inprons deposits in the Surkhandarya district, the incorporation of which in the metallurgical process is substantiated by the presence of numerous ancient excavations. However, subsequent investigations proved that such a type

of a comparison was quite incompatible for the following reasons : If fluctuations in the metalic content in coins were of a regularised nature only by natural circumstances, while ore-bearing sources remained unchanged, then the dependency limits of such contents would not be observed periodically altogether. While, in the event of a change in the location of deposits, this type of interdependency would be of a multistage nature and, just in case of some of these elements, would definitely prove to be of a rising character.

In reality, a process takes place of monotonous reduction in functional content of certain individual elements in the course of prolonged time lapse and comparative data of the contents of elements in areas of ore deposits as well as in coins has not been presented so far for the following reasons :

(i) It is most unlikely that, in order to make comparisons, it will be possible to select those particular deposit areas in which ore was used for minting of the particular coins;

(ii) Content of elements in ores as well as in coins differs appropriately simply because of the fact that even the most primitive metallurgical process redistributes such metals; and

(iii) If dispersion of contents of any specific element in a particular type of ore is in substantial proportions, the comparison of analyses is absolutely out of question and, on the other hand, if dispersion rate is insignificant, then such content of metal will be typical only for the ruler. In order to explain the other contents of the same element in the minted coins of other rulers, it may be feasible either evidently through an unrealistic presumption that each ruler exploited only his own ore deposits or, which is quite logical to suppose, by possessing technological know-how in respect of the methods of preparing alloys.

The presence of descending interdependencies in the variability of elemental contents may possibly be explained in terms of the gradual excavation of ore deposits from top bottom, i. e., a transition from ore far more susceptible to effetcs of oxidation to those that are less afflicted by such metamorphosic processes. In such cases, the content of certain metals would become reduced while that of the others would increase proportionately. However, in actual condition such a process was never observed before.

Thus, a statistical processing of results obtained by means of a spectral analysis makes it possible to arrive at certain deductions :

(i) Distribution of contents of chemical elements (arsenic, tin, lead, molybdenum and zinc) in the coins of the Kushana period as well as of post-Kushana kings is closely associated not with sporadic changes in sources of ore deposits, but with a deliberate process which is regulated by the development of copper smelting process.

(ii) Established regularity of correlation of impurities content in different coins with a long period of time may be explained by the variations in metallurgical formulations or, as it may well be, through improvements of technological processes, or as a result of certain economic economic reforms that were carried out within the state or, alternatively, by a conjunction of all these reasons taken together.

(iii) Reduction in the value of correlative coefficient by the introduction into calculations of analytical results of post-Kushana period coins (Table IX-X) evidently testifies, on the basis of the variation in the earlier revealed regularity, that a beam of discending straight lines tends to become more sloping in view of the reduction in the angle of inclination as shown in the plotted diagram, and such evident distinctions only stand as proof that the process of metallurgical evolution, during the particular period becomes retarded. Inspite of the fact that by this time, the copper coins became sufficiently homogenous, no new element has been included into their composition and, instead, a substantial amount or impurities is added to the metallic coins that imitate the late Kushana period of minting through introduction of iron. Minting process of such coins is basically very simple, rough, slipshod and lacking in finishing touches of details. Such types of coins, apparently, suited both the consumers and the mint-masters. In effect, this speaks only of degradation in technical and artistic creation not only of metallurgists alone, but minters as well.[4] The proposed transition in the minting trade towards making use of brass alloys obviously failed to materialize in this specific period on a mass productional scale and, quite possibly, this might have been largely due to technical complications associated with separate stages of production.

According to our personal opinion, the results thus obtained, may have a significant bearing not only upon the historical nature of monetary metallurgy but also at times, the solution of controversial matters relating to chronological aspects. Particularly, while discussing properties of coins of Soter Megas period which some of the research workers regard as a contemporary of Kadfiz II (while the others identify them with Kadfiz I) concrete data of accomplished investigations speak in favour of the last position mentioned. Nevertheless, it should be emphasised that such kind of evaluations should be exämined with extreme care and only on the basis of historically substantiated facts, definite conclusions should be arrived at.

The revealed relationships of composition would be quite interesting to verify periodically, on the basis of Indian specimens of the available Kushana coins and investigations of such nature will permit not only to solve the problems relating to the evolution of copper-smelting technology within the limits of one particular region but also to make far more important generalized conclusions about the similarity and differences in the evolution of monetary metallurgy of India and Central Asia on the basis of their comparisons.

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MODES OF TECHNOLOGY TRANSFER BETWEEN INDIA AND CENTRAL ASIA (c. 1200–1650 A.D.)

I. G. KHAN

In this article an attempt has been made to study not merely the technological exchanges between mediaeval India and Central Asia (with special reference to metallurgy) but also the various forces of material culture which acted as promoters of such activity. My approach to the problem of exchanges in technology and culture is based upon the insights gained from the exhaustive and precise methodology of Joseph Needham whose works, though centred around China, have much to offer on the Central Asian and Indian technological culture[1]; and the observations of A. J. Qaisar who feels that "any attempt at estimating the response of one culture to another perhaps inevitably entails a study of the degree and pattern of contact between members of the concerned culture groups"; a factor which is in turn to be studied in the light of large-scale trading contacts, the size of the 'foreign' population, their objectives and the means of diffusion of products and ideas brought by them.[2]

In the context of these broad guidelines, one may concertize the issue by focusing on early Central Asian contacts with mediaeval India. In the absence of direct literary or archaeological evidence, transfer of technology in a time-and-region frame can only be deduced from a variety of interesting political and socio-economic phenomena. For obvious reasons, these numerous factors cannot be dealt with in detail and can merely be touched upon. However, there are certain issues one would like to discuss in some detail where these concern vehicles of technological information between mediaeval Asian cultures.

The premier mediaeval stimulator of technological development and exchange was military activity. Along with this could be considered the movements, either voluntary or by force, of artisans skilled in various metallurgical techniques. The phenomenon of slave-labour as the basic building-block of mediaeval Indian and Central Asian production processes must also be given the attention it deserves.[3] The socio-economic position of the Central Asian feudal, "consuming class", especially whether it constituted a viable demand on technology at all, cannot be studied here in detail—but it is an excellent topic for further historical debate.[4]

In this paper we can merely go into the most essential details of trade patterns and the quantum of metallurgical products as a component of Asian over-land trade for the period c. 1200—1600. Brief outlines of political and economic trends of these regions would have to be referred to in order to bring

out the continuity of these processes. Lastly, we cannot overlook the role played by the immigrant nobles and scholars whose writings also led to the dissemination of technological information.

Before going into the details of these factors, the problem of geographical and chronological boundaries must be clarified along with the nature of the source utilized.

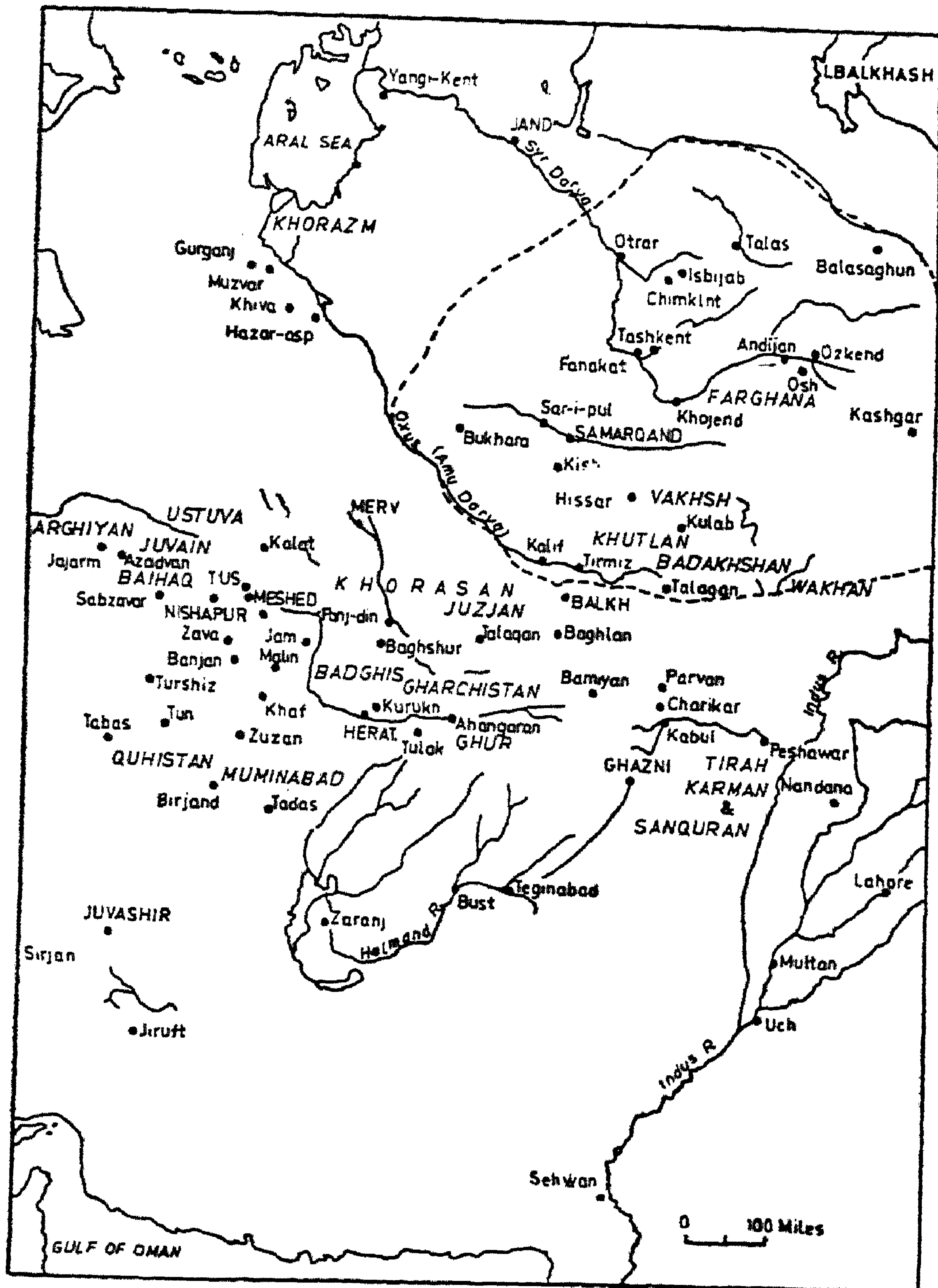
The Region :

Broadly speaking, 'Central Asia' of our definition may be taken to represent the regions south-east of the Aral Sea with special focus on the cluster of important centres such as Samarqand, Bukhāra, Urgenj, Andijan, Tashkent, Khojend as well as the original Uighur homeland comprising, Khotan, Kāshgar, Urumchi etc. (i.e, the regions lying between 60° and 80°E longitude and between 35° and 45°N latitude : (see dotted area in Map A).

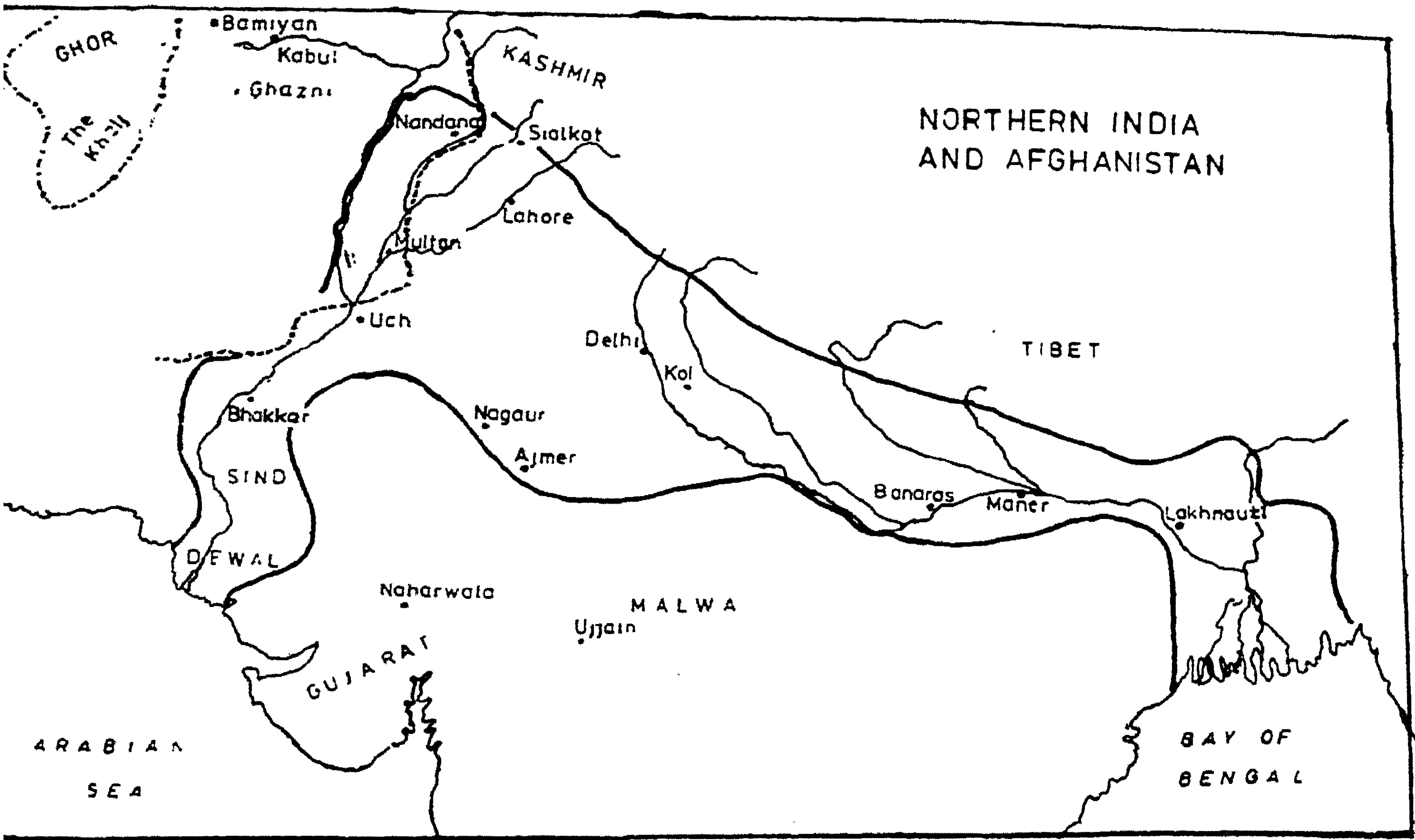
The problem of demarkating the northern boundaries of mediaeval India is rendered complex since between 1200 and 1650 no less than 50 major north-south attacks took place, each one presumably inducing some change in the line of actual control.[5] For instance, Balkh and Badakhshān hardly ever remained for long under Mughal control although the desire for the "scientific frontiers" provided by the Hindū Kush mountains was a constant motive for their northward plans and was achieved only in 1647 by Shāh Jahān.[6] (See Maps B and C. B shows the Sultanat boundaries while C delineates Bābur's and Akbar's possession).

Except during the reigns of a few powerful rulers, the Sultāns of Northern India were never in complete control of areas under their suzereignty. Local dynasties kept coming to the fore fragmenting the Empire until the arrival of the Mughals in 1526[7]. However, even the Mughals at the height of their political power in 1605 could not retrieve Balkh and Badakhshān from the Uzbeks and Abū'l Faḍl, the court historian of Akbar wrote—"The country (N. E. of Kābul) is surrounded by lofty mountains so that the sudden invasion of an enemy is attended to with extreme difficulty."[8] He laid stress on the complexity of the region and named the eleven languages/dialects spoken in this area.[9] He also gives us an idea of the ancient boundaries when he writes—"The wise of ancient times considered Kābul and Qandahār as the twin gates of Hindūstān, the one leading to Turkestān (C. Asia) and the other to Persia . . . ."[10] But these twin gates left a large area (now N. Afghanistān) as a buffer zone which was domitated by the Uzbeks because of whom even Akbar had to stay in Lahore for ten years until the death of 'Abdullāh Khān Uzbek in 1598.[11]

This region became economically important with the development of the silk trade by the Chinese in the Ist century B. C. Later, with the division of



Map A—Broad Area of Central Asia (within the dotted line). Reproduced from Boyle, J. A. (tr) : *The History of the World Conqueror of Ata Malik Juvaini* Vol. I, Manchester University Press (1958)



——Boundary. Delhi Sultanate, 1236
·Limits of Mongol control 1260

MAP B

BOUNDARIES OF THE MUGHAL
EMPIRE - BABAR AND AKBAR

Kabul
Srinagar
Qandahar
Lahore
Multan
Delhi
Agra
Ajmer
Patna
Allahabad
Ahmadabad
Ujjain
Burhanpur
Cuttack

34° 30° 26° 22° 18°
68° 72° 76° 80° 84° 88°

— — c. 1530
—— c. 1605

Map C

China into a northern and southern empire c. 300 AD the traders from the South preferred to go across the Pamirs straight to Chitral and then into India, this become a better proposition than crossing a Sassanid Persia which was hostile towards Rome c. 224-656 A. D).[12]

It was therefore this region which controlled the passage of trade between China, Persia and Rome; between China, Central Asia, and India; and between China, Central Asia and Byzantium. As such, it needs to be studied separately as a melting-pot of various cultural (ethnic and socio-economic) and military forces active in the relations between India, Central Asia, China and the West.

The Sources :

Most of the sources available are literary and deal mainly with the political histories of the regions under consideration. One can never be too grateful for the information provided by the Arab, Persian, Turkish, Chinese and European travellers who furnish direct as well as indirect evidence on the state of technology in the regions visited by them. In this respect one is compelled to deplore the indifference of most of our sources towards details of the actual production process, an attitude probably derived from an upper-class disdain (with notable exceptions e. g. Ibn Buṭūṭa) for crafts in mediaeval societies. A number of terms have been wrongly used and the failure of latter-day translators to identify the metal or alloy implied by an unusual term can lead to erroneous conclusions in researches in the history of technology.[13] (For details on contemporary and secondary sources, see Appendix I).

As is obvious from the Appendix, one must explain one's preference for literary evidence in the study of exchanges in metal technology, in the light of Selimkhanov's lamentation about the scarcity of metallic finds from mediaeval Islamic archaeological sites. In mediaeval times great value was attached to metal scrap which was collected and re-cycled. This makes it diffiult to come across any sizeable finds deteable to any specific period.[14] Another problem is the negligence shown toward chemical analysis of metallic finds by most archaeologists.

Production and Trade in Central Asia :

Metallurgical technique in Central Asia received periodic infusions from neighbours and conquerors. By the Ist century AD the Graeco-Bactrians introduced cupro-nickel coinage in Central Asia.[15] About a century later, some Chinese deserters taught the Ferghanese artisans techniques for casting iron weapons and fabricating "white and yellow alloys" (probably cupro-nickel or cupro-antimony alloys which the latter had immediately casted into vessels—much to the disappointment of the Chinese who were probably expecting them to make counterfeit currency).[16] With this basic metallurgical know-how and the vast natural resources at their disposal (e. g. the copper, silver, lead, tin and iron mines in the Tarim basin,[16a] the silver, arsenic and antimony between Badkhshān and

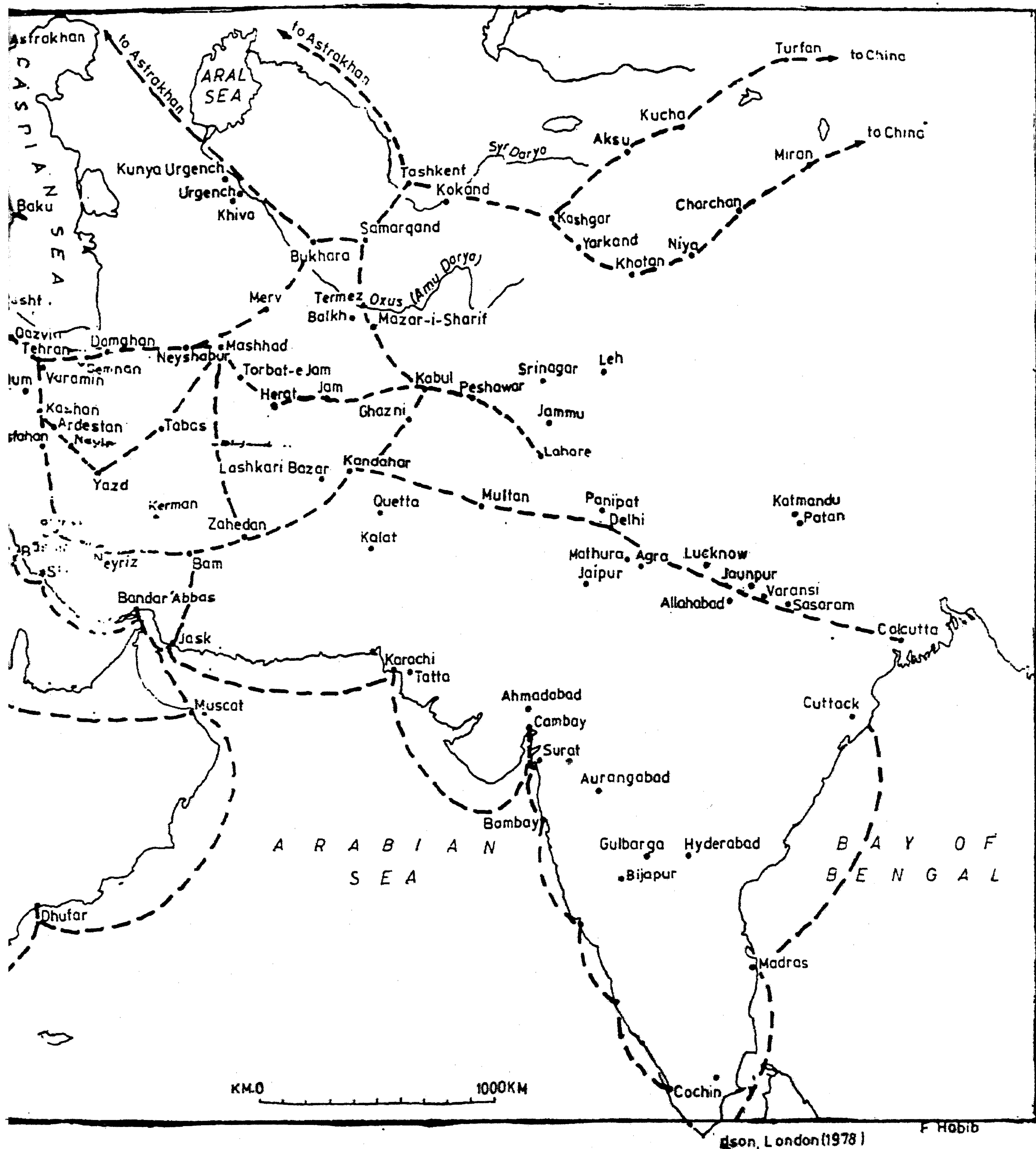
Balkh and Kābul; copper at Bukhāra[17]; iron at upper Nasya; nickel near Murmansk, and Krasnoyarsk and in the Kazakh region; and the lead-zinc complexes near Kansai[18]) one would have expected major developments to have taken place. However, the economic forces of the fist millenium A. D. were merely conducive to allowing the Central Asians, the role of physically transporting the China—India—Rome overland trade. It was their ability to navigate these barren regions that made the chinese as well as the Indians and Roman traders induce them to follow the role of carriers—a function they continued to perform well into the 18th century.[19] (For details of trade routes, See Map D).

It was therefore, in the interest of the handicraft giants of the ancient and mediaeval civilizations, namely India, Rome, China and Persia[20] to keep this region 'colonized'. Consiquently, Central Asia paid for all its essential as well as its luxury items through the export of fruit, jade, minerals i. e. mainly in the form of articles of consumption and some of its manufactures such as large cauldrons, felts and paper. (Samarqand was one of the earliest recipients of rag-paper technology, c. 720 A.D. The extremely low cost of coal (approx. 2 dam for 165 kg) in Central Asia and its export to China is an indicator of the highly underdeveloped industrial production prevalent in this region.[21]

It is therefore not surprising to find al-Bīrūnī (c. 1020 A.D.) dismissing the white metal utensils of Central Asia as "Crude and not as good as those of China". He does praise the small castings such as hair clips and amulets made "for the women of Hind". All this implies a primitive industry in large iron and non-ferrous casting such as cauldrons and large pots. On the other hand the vast availability of antimonial copper and lead ore allowed them to specialize in small, sharp ornamental casting (e.g. hair clips) amulets, broaches, arrow-heads, etc.). This was facilitated by the inherent property of antimony to expand on cooling which allowed the molten metal to fill into the finer details of the mould even as it cooled. It gave the extra point and edge to the fabled "Kharchini" arrowheads which were also endowed with the added quality of being poisonous due to the presence of lead and arsenic in the ores. These arrows were in great demand at Delhi c. 1330 as item of gifts.[22]

The presence of a variety of minerals in the ores and the adding of copper and zinc redered the items of jewellery golden and silvery variegated in lime and tint. These items of "junk jewellery" were very popular amongst the ordinary womenfolk who could not afford the real thing".[23]

The Mongol conquests under Changez khan (inilially) gravely affected the trade and crafts of Central Asia. Agrarian experts such as Lampton and Sinkin have even pointed to a reversion to a natural economy in regions where a cash nexus had become current.[24] This refutes the exhortations of Juvaini (The Mongol Chronicle and author of *Tarikhi Jahankusha*) who praised Changez Khan and his



Reproduced from Michell G, (ed.) Architecture of this Isalamic World, Courtesy Thomas and Hudson, London, 1978.

Map D : Trade Routes between India and Central Asia

successors for having restored prosperity to Central Asia. This contradiction is resolved once we perceive these two observations over two phases of Mongol rule i.e. the initial conquest and the subsequent consolidation under and older Changez and his immediate successors. The latter period witnessed the restoration of trade and the ensuring of good prices to traders. However the quarrels between the later successors like Chaghtai and the Outbughs and then the further sub-conflicts resulted in the fragmentation of Changez's economically promising empire. The trade routes once again became unsafe and the Central Asian region became a battle-field between mara tribes.[2a]

Central Asia went through a lean period until the cstablishment of Tīmūr,s capital at Samarqand (c. 1370). The influce of war booty led to a significant increase in the demand for Chinese and Indian luxury goods. Tīmūr's vast military designs may also have created a demand for arms and armour.

Tīmūr's measures, however, tended to alleviate two factors responsible for Central Asian backwardness, its dependence on the carrying trade, and the absence of sizable production centres. His immediate target on most of his expeditions would be the artisan. Thus, for example, when he raided Delhi, he carried away a number of weavers, metalcasters, etc. He also abducted swords-miths and armourers from Damascus and set up a manufactory in one of his castles.[25] His efforts seem to have borne fruit since one of his manufactories as Samarqand produced a 2-ton bronze 'cauldron' in c. 1400 which is said to be the largest and finest piece of Islamic metal work in existence.[26] But the fact that the armours produced here was brittle and untempered[27], shows the defects inherent in such forcible abduction of technical know-how i.e, the tendency on the part of the artisan to hold back the finer points in technique. However, coming back to trade, Tīmūr ordered the closing down of the Kirman-Hormuz route and thc diversion of all trade towards Samarqand Bukhāra. These steps did lead to an increase in trade was well as in metallurgical productivity.

However, the revival of maritime trade and the hostile nature of the Central Asian environment were two very strong forces acting against the prosperity of this region. Thus once military compulsion became weak and the needs induced by expansionism subsided, the traders and artisans migrated to more economically active regions.[28] The only notable development in this period was the observatory at Samarqand built by Ulugh Beg, a grandson of Tīmūr.

The Tīmūrids were succeeded by the Uzbeks who unified the entire region of Central Asia. Shaibanī Khān Uzbek had expelled Bābur, and Abdullāh Khān, his successor posed a threat to Akbar who was forced to shift his capital to Lahore for ten years until the death of 'Abdullāh Khān in 1598. 'Abdullāh Khān is to be remembered for constituting the first organized artillery in Central Asia in c. 1580.[29]

Having described the overall changes in the political and technological conditions in Central Asia, we may now consider the military and economic exchanges as well as the general conditions in India. The Mongol devastation of Bukhāra and Samarqand was so total that it resulted in the breakdown of trade relations between India and Central Asia. By 1192 the Battle of Tarain had been won by the Ghuride and by 1250 the nascent Turkish slave 'Sultanate' of north India was acting as a refugee camp for those fleeing the Mongol devastation of Central Asia, Khorezmia and Persia. Most of these refugees belonged to the landed aristocracy and the religious clergy which had established itself in Bukhāra, Balkh, Merv, Samarqand etc. and some were artisans who had managed to escape being forcibly conscripted into the Mongol armies. Although it is not possible to arrive at a pertinent guess regarding the percentage of artisan amongst the post-1220 immigrants from Central Asia, one could safely assume that they were assigned to the royal kārkhāna or found work in the workshop of the free artisan. The Turkish sultanat was characterised by a degree of urbanisation[30] accompanied by centralisation, with a reliance on Central Asian Turks for bureaucratic as well as military efficiency.[31] These conditions made India the ideal new home for the Central Asian soldiers, artisans and *ulema*' (the latter, as may be expected, also became successful traders).[32]

Slaves were the most basic and prized possessions of the early Sultāns and there is sufficient evidence to assert that slave-labour was vital in the production of metalware. The features of this period that we earlier made mention of (viz, urbanisation, centralisation, etc.) also led to the activisation of social and economic forces which gradually transformed these slaves into independent producers.[33] They were still exported to Central Asia as was the 16th century and the demand for them is shown by the periodic abduction of artisans by the successors of Changez especially Timur well into the 15th century.[34] Artisans slaves of different regions were forced together in the *Karkhana* and this led to exchanges as is evident from the 13th century bronze flask which shows a synthesis of Mongol and Persian craftsmanship.[35] In other cases they could withhold the information. as happened in the case of the untempered armour made for Timur by his Syrian armourers[36] at Samarqand.

Trade between India and Central Asia recovered after 1350. Marco Polo, Mustoufī, Claviji, etc, do indicate a sizeable volume of trade between Persia Central Asia, China and India. Indian goods mostly consisted of textiles, spices, hemp, and indigo with some specialised items of metalware. Earlier ingots of wootz steel were sent to Syria via Central Asia but now the Central Asians seem to have required the technique of converting pig iron into steel.[37] Central Asia also exported, apart from foodstuffs and leather, drugs such as haphtha, bitumin, sal ammoniac, as well as paper, swords, needles, pots and slaves.[38] A word of caution is necessary at this point. It is essential when dealing in particular with the source on trade not to identify the exports of a particular region with its

produce. For example, porcelain and silk were in fact re-exported from Central Asia and were not manufactured there.[39]

Whether a sizeable, viable market for Indian metalware could have been stimulated by Tīmūr's revival of overland trade is a question which needs to be examined. Claviji does report an increase in the revenue from taxes levied on Indian merchants. The Ganiza records as well as the Portugese and other European as well as Chinese, Afghān and Persian sources are full of references to the import of brass, copper, tin, zinc and scrap from Africa, Kirmān (Iran), Bukhāra, Egypt, Central Asia and S. E. Asia, and the exports of finished metalware to these countries.[40]

The rise in the indigenous demand for icons and the auspicious nature of certain metal combinations led to the development ef non-ferrous matallurgy. While South India was known for its 5-metal (*pancaloha*) and 8-metal (*aṣṭa-dhātū*) complexes, north India enjoyed the strategic advantage of received know-how both from the north as well as the south. The '*Ain-i-Akbarī* and earlier sources mention various ways of making brass with different percentages of zinc, they also mention other copper-based alloys having five to nine components as well as alloys of whose they are not sure. Abū'l Faḍl mentions a 7-component alloy namely *haft-josh*.[41]

Alloys having exotic names such as *kharchinī*, *ahanchinī*, taliqun, *haft-josh*, etc. mentioned by Jābir ibn Ḥayyān (c. 760 A. D). Zakariya al-Rāzī (c. 700) Al-Bīrūnī, Al-Khwārazmī, Ishbillī. Abul Qāsim Kāshānī as well as all the writers of encyclopaedia, books on alchemy, books on metals like Rustamdarī and Fāzil Samarqandī. They all ascribe these alloys to regions bordering China and mostly refer to cupro-nickels, cupro-antimonates and other poisonous alloys,[42] since none of these regions, north and south India, had access to nickel, antimony and arsenic ores.

Apparently the indigenous demand for metalware in the form of icons, luxury items, weapons and utensils was large enough to absorb a major portion of local production, a fact which is reflected in the relatively low component of metalware in the overall exports from India during this period. In fact the demand in Kashmir induced an inflow mainly of design and technology from Central Asia since there was an abundance of copper deposits in this region.[43] Even today, a number of decorative and house-hold utensils are known by their provenence viz, Bukhārī, Balkhī, etc.[44] It was also via Kashmīr that India received paper and leather technology.[45]

In view of such evidence in favour of a limited metal trade (India's forte being textiles and spices while Central Asia specialized in horses, felts, fruits and slaves), one tends to agree with Braudel that as in the case of 16th century European trade, metalware did not constitute (until the 18th-19th centuries) a

factor sizeable enough to have caused a tilt in the balance of material civilization.[46] Thus trade could merely act as a carrier of technological information: the rest would depend on the socio-economic conditions of the recipient culture/civilization.

Non-commercial Channels of Technology Transfer

Coming to the role of the written word in technological exchanges, the most outstanding and perhaps the best post-Bīrūnī source on technology and artisans in North India with references to Afghanistan and parts of Central Asia was the *Ādāb ul-Hārb wa'l Shujā'at* written in 1229 by Fakhri Mudabbir as a war and diplomacy manual for Iltumush. In a section on diplomacy the items listed as gifts to other monarchs include swords, utensils, daggers, shields, double-pointed spears, arrows, bows, armour such as coats-of-mail, doublets helmets, shin and arm covers, cauldrons, as well as the usual items of luxury such as gems, silks, carpets, perfumes, drugs and ornaments.[47] Works such as these were profusely copied and were depended upon as guides. Scholars were also sent to record the peculiarities and products of neighbouring regions and their accounts also facilitated the flow of technological know-how. One Mīrzā Ḥaydar was sent by Shāh Shujā, a son of Shāh Jahān, to write about the marvels of Kashmir, Tashkent, Turan, etc.[48]

Diplomatic gestures and etiquette also helped in this process. For example, the letters of Rashiduldin Fadlullāh, the author of *Jāmī-ul-Tawārikh* show a list of metallic varities and other articles sent by Sultān Allāuddīn Khaljī to the Ilkhanid Vazīr c. 1300.[49] Muḥammad Bin Tughluq also sent some swords, armour and textiles to China with Ibn Baṭūṭa.[50]

Royal purchase missions were also sent from India to Central Asia and the Turkish Sultans—the items bought back by these missions were copied and even improved upon in the royal *karkhānas* of India e.g the duplication of European matchlocks and cannons in Akbar's reign.[51] Although attributed to Akbar's personal genius by Abūl Faḍl, and probably an innovation of Shāh Fatḥullāh Shīrāzī,[52] the Akbarī artisans began making the iron barrel by lateral rolling of iron sheets. Earlier the barrels were made simply by folding the sheet end-to-end and welding along the edge. Abul Faḍl also reports the casting of cannons which could be screwed together and taken apart to facilitate transportation. This model seems to have been copied from a Turkish design of c. 1467 described by Kritoboulos.[53] The *Bāburnāmā* also gives a fairly detailed account of the eight furnaces simultaneously feeding one large cannon mould. The main barrel was of bronze reinforced by iron bands.[54] Thus the force of the written word was not as ineffective as one would expect in pre-printing societies because it did reach a section of society which was in control of technological change.

Perhaps the most widespread as well as influential agent of technological development and dissemination was war itself. The development of warfare led

to the need for a recorded body of information leading to the writing of war manuals. Thus in the *Adāb ul-Ḥarb*.. Fakhri Mudabbir enumerates the weapons and artisans necessary for establishing new fortresses. The list includes mangonels, carts, chains, battering-rams, axes, sholves, iron fire-throwers, apart from the conventional pieces of iron armour. He also names the craftsmen needed, viz, the swordsmith, the general blacksmith (*āhangar*) the polisher of swords (charkhgar, or *sigligar*), the arrow maker (*tīrgar*), the carpenter (*durūdgar*) apart from which he mentions the saddler (*sarrāj*) the chain-maker (*chil-angar*), the maker of coats of soil (*zarrad*) etc.[55]

This nucleus of technology, i.e, the mediaeval fortress was destined to diffuse technology because the besieger was compelled to discover and, if possible, copy the defender's weaponry and techniques. In addition, the number of military expeditions undertaken in north India, Afghanistan, Kashmir and the Oxus basin was also very high. No less than fifty major north-south military exchanges were undertaken between 1200 and 1650, not to mention the mino attacks.[56] Most of these major attacks were from the north and led to the Central Asians, particularly the Mongols and Timurids acquiring sizeable technological information and expertise in the form of captured arms-armour, written texts and kidnapped craftsmen.[57]

Perhaps the most vital technological contribution of Central Asia to India, in this context, was the iron stirrup, the horse-shoe and other items of horse-armour. The secret of the Turkish success against the Indian princes was their ability to use the bow, the lance and the sword in combination with the mobility of the shodden horse.[58] Neither the iron stirrup, nor the horse-shoe were in India before the 12th century A.D. On the other hand, Russian archaeological reports and clear depiction of the former in Central Asian paintings establish beyond doubt, the common usage of the stirrup in this region by the close of the 6th century A.D.[59] It was only after the arrival of Turkish merceneries and Indo-Turkish military exchanges that all the essentials of an effective cavalry are to be found in north India.

Here we arrive at a point mid-way between that expressed by Sobert Werner (*Krieg and Kapitalism*) and Nef (*War and Human Progress*).[60] We find wars destroying the trade potentials of Central Asia and at the same time providing it with valuable metallurgical techniques. However, the negative influences were more permanent than the incentives produced by war. Although the rate of diffusion of military technology was always faster than non-military technique, the demand could also be transient and tended to die down in times of peace.

Wars also tended to disrupt the organic relationships between centres of metalware production and their natural resources, a relationship vital to this day. In this connection one may also point out the role played by nomadic and semi-nomadic metal-working tribes who migrated from Central Asia to India such as

the *Asur* of Central India (Nagpur),[61] or the *Khidr-Eli* tribe of Central Asia who flourished in the Caspian region from the 15th-17th century A.D.[62] Apart from military compulsions or their inherent nomadism, artisans of the mediaeval Islamic civilization are known to have migrated several times through economic compulsions or religions persecution or in search of a better life, e.g. the influx of all manner of craftsman from Palestine, Syria, Khorasan, Central Asia, etc. into Cairo in the 12th-13th centuries.[63]

Other significant transfers of technology in this region also help to illustrate the effectiveness of the modes highlighted in this paper. It was from Central Asia that India received the apparatus for the distillation of the true alcohol. India gave to Central Asia its ancient horizontal loom and Central Asia rather belatedly returned the favour by transmitting to India (c. 14th cent.) the treadle which it had received from China.[64] This device allowed the weaver to operate the loom with his feet and is found depicted in the *Miftāh ul-Fuzalah* (c. 1471-2) of Shāhdiabadi (B.M. MS No. OR 3299). Central Asia transmitted to India, the more complex drawloom sometime in the 13th-14th centuries. The earliest reference to this device is found in Isami's *Futūḥus-us-Salāṭīn* (ed. by Usha, Madras, 1948, p. 114).

Other important technological transmissions to Central Asia were the worm-press (Hind *Charkhi*) used for separating the cotton seed from the fibre. This device, the details of which are too well-known to be repeated here, was transmitted to Central Asia in the 11th cent. It was fitted with a crank-handle for turning the rollers only in the 18th century.[65]

Another cotton-cleaning device earlier thought to be an import from the Islamic civilization, namely the carder's-bow (Arabic *nadaf*, Hindi *Dhanak*) has recently been established as an early Indian device. A reference to this device has been discovered in one of the *Jatakas* (in Pali) dating to the 2nd cent. A.D. The Islamic East dot the carding-bow from India in the 11th cent. While the earliest evidence for its use in China can only go as far back as the 13th century when China began cultivating cotton.[66]

The variety of crafts in the region through which these exchanges occurred, namely Kashmir, is a living testimony of its effectiveness.[67]

Therefore, it may be asserted that the mutual transfer of technology between India and Central Asia in mediaeval times was a very important segment of inter regional transfers of technology. Much of what is known to be technological apparatus of mediaeval Indian civilization from the 13th century onwards could really have come from the technological heritage of Central Asia. At the same time reverse waves of transmission were also effective in enriching the technologies of Central Asia, metallurgy and textiles being two very outstanding recipients. The pace of transmission in such societies was bound to be slow and uneven, the actual configuration being determined by factors such as war, commerce and the

migration of artisans. In areas beyond the pale of these activities, the response was noticeably poorer e.g., in agricultural techniques.[68]

Notes and References

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2. Qaisar, A. J. : *Indian Response to Western Technology and Culture* (14981-1707) O. U. P. New Delhi, (1982) p. 5.
3. For some details, see Irfan Habib's Chapter on non-Agrarian economy and urbanisation in Roychowdhury and Habib (eds.) *Cambridge Economic History of India* Vol. I, pp. 76-92.
4. An excellent source on mediaeval Bokharan gentry is the *Muzakkir-i-Ahbāb*, (c. 1566) Nithari (published also MS in Leningrad). I am grateful to Iqtidār Álam Khān for drawing my attention to this book. Although about poets this book also shows a growing interest in metal crafts, amongst the C. Asia idle rich.

   There is an interesting painting of the Bokhara School (c. 1570) which shows a young prince engrossed in hammering out a horse-shoe. See Martin, F. R.: *Miniature Paintings and Painters of persia, India Turkestan*, London (1912) Plate 151. On the Central Asian nobility in India see Shahnawaz Khan's *Mā'asir-ul-Umarā'* to Beveridge, H. Patna (1979) Vols. I-III.
5. See various political chronicles ranging from the works of Fakhri Mudabbir (*Adāb-ul-Harb*) to the works of A. Ham īd Lāhorī (*Bādshāhnāma*).
6. See article by Ali Athar on "The Balkh Expedition" *Proc. Indian History Congress*, 1966. Also, Ali, Athar "Jahangir ond the Uzbeks" *Proc. IHC*, 1964; Also Khan, Zahoor Ali : "Quest for Scientific Frontiers" (cyclostyled paper) Read at Indian history Congress, 1979 Seassion.
7. For a detiled poltiical history of this region for this period see Habib and Nizami (eds.) *A Comprehensive History of India*, Vol. V. P. P. H. New Delhi (1982).
8. *Ain-i-Akbari* (to Jarrett) 1878 reprint, II, 405. For Mughal boundaries in 1595 and 1647, see Irfan Habib : *Atlas of the Mughal Empire*, O. U. P. (1981) Map. 1, A-B. I am grateful to Faiz Habib for drawin all the maps in this paper.
9. *Op. cit.*, p. 406.
10. *Op. cit.*, 409.
11. For details, see Haider, Mansoora "The Relations of Abdullāh Khān with Akbar" Paper (cyclostyled) read at *Indian History Congress*, Chandigarh Session 1973. I am also grateful to Mrs. Haider for helping me with the Russian sources.
12. On the role of ancient and medieval trade-routes between C. Asia, see Sen, S. N. : "Trade Routes and the Transmission of Scientific Ideas between India Central Asia". *Proc. of the Indo-Soviet Seminar on Exchange in Sc. and Tech. between Med. India and C. Asia* (to be published).

    For some interesting articles on ancient and mediaeval Afghanistan, see Lal, K. S. (ed), *Studies in Asian History*, Asia (1969).
13. This author has highlighted this problem of terminologies in an earlier article. "On the Identification of some Central Asian Alloys mentioned in Medieval Indian Sources" *Proc. of the Indo-Soviet Seminar on Exchanges in Science and Technology. . .* Bombay, 1981 (In press).

14. See remarks by Selimkhanov in hisarticle on Seljuq metallurgy, Roed at *Conference on the History of Islamic Science and Technology*, Istanbul, 1981, Vol. III.

15. Specifically, the coins of Euthydemus II, the constituents of which were as follows : Copper 70.5/; Zinx=10.3/; Lead = 6.6/; Iron = 1.4/; Nickel= 11.2/; Cobalt = 0.6/ as per Cheng and Schwetter quoted in Needham : *Science and Civilization in China, V* (2) p. 230. But Ferghana lacked a money economy and hence the pots and pans.

16. *Ibid.* pp. 214-220.

16a. Simkin, C. G. F : *The Traditional Trade of Asia* Oxford, (1968), p. 67. See also refs. to C. Asian mines in Samarqand's *Jawāhir ul 'Ulum-i Humāyūnī*, MS No. 87. *'Ulum Fārsia,* AMU ff 251.

17. Marco Polo-*Travels*, ff : Abul Fida and Ibn Hauqal reports copper at Bukhāra vide Le Strange, *Lands of the Eastern Caliphate* (Cambridge University Press 1930); for description of antimony deposits in wakhah mountains, see *Arais ul Jawāhir. . .* Tehran (1348 H), pp. 241-2.

18. Barthold : Turkestan. p. 164, 169; See also A. Lavrischev, *Economic Geography of the U. S. S. R.*, Progress, Pub, Moscow, 1969, 43-47. See also Prof. Romanofaky's report to Genl. Kaufman (1874). on the mineral wealth of Turkistan. Quoted in Schuyler's Turkistan. p. 160-1; see also Adam Mez : *The Renaissance of Islam*, pp. 441-2. On mineral deposits in India, see *Wealth of India* Series published by C. S. I. R., New Delhi on Afghanistan, *Memoirs of the Geological Survey of India* Vol. 18 (2) and Vol. 39.

19. Lowe, Michaelt "Spices and Silk. Aspects of World Trade in first seven centuries of the Christian Era" (Review article of J. Innes Miller' s *The Spice Trade of the Roman Empire*—298 BC to 641 AD. Clarendon Press, 1969) *Journal of the Royal Asiatic Society*, London, 1971, No. 2, pp. 168-177.

20. According to Simkin, (*op. cit*, pp. 254-5) the silks, pottery, textiles and metalware of India (as well as her 'wootz' steel) and China went to Europe and helped extract spices leather, furs, livestock, minerals from Central Asia and South-East Asia.

21. *Kitāb al Jamāhir fī Ma'arifat ul Jawāhir* published by Dairatul Maarif, Hyderabad, p. 267; Abūl Qāsim Kāshani '*Arais ul Jawāhir. . .* Tehran, p. 240; Le Strange *cands of the Eastern Caliphare.* p. 471.

22. Gibb, H. A. R. (tr) *Ibn Baṭūta-Travels in Asia and* Africa (1325-1454) R. K. P. London (1963) p. 185.

23. *Cambridge History of Islam.* The Central Asian Lands, Vol. V, 513; see also Simkin; *op. cit*, off : Richards (ed.) *Islam and the Trade of Asia*, Cassirer pubs., London (1968).

24. See the comments by travellers like Sidi Ali Rais, Nikitin, Jenkinson etc. on the conditions of trade in Khorasan and Central Asia. See also Boyle (tr) *The Successors of Chengez Khan* (a part of the *Jāmi'ul-Tawārikh* of Rashīduldīn Fadlullāh).

25. Clavijo ; *Embassy to the Court of Tamerlane* (1403-1406) R K. P. London (1928). pp. 287-293.

26. Rice, D. T. : *Islamic Art*, Thames and Hudson, (1975) p. 212.

27. Clavijo : *op. cit*, p. 290.

28. On post-Timur conditions; see Spuler, B. : *The Muslim World*, II, p. 69; on migration. of artisans, see Goitien, *Studies in Islamic History. . . .* Leiden, 1966 (pp. 279-295).

29. The *Mirātu'l Mamālik* of Sidi Ali Rais (1550) (tr. by Vambery) fails to mention any proper piece of artilery. In fact Ali Rais match-locks were stolen and were not returned despite royal intervention. pp. 74-76.

30. According to Batūta, Delhi was the biggest city of the Islamic East, see *Rihla*. p. . . . 194.

31. See *Tabaqāt-i-Nāsirī*, *Tārīkh-ūī-Fīruzshāhī*, *Fatāwai Jahāndarī* of 'Afif and Minhājus Sirāj in *Comprehensive History of India*. Vol. V.

32. Cf. *Tabaqāt-i-Nāsirī*, vide Irfan Habib in *Cambridge Economic History*, Vol. I, p. 85. This section lays bare the agricultural as well as non-agricultural revenue systems of the early Muslim periop in India. On the 'Urban Revolution', see Mohammad Habib's collected Essays entitled *Society and Politics in Early Mediaeval India*, K. A. Nizami (ed.) vol. I. P.P.H. (1974), pp. 59-85. For an excellent account of the period to 1528, see Habib and Nizami (ed.) : Comprehensive History of India, V. PPH, pp. 37-709.

33. Firuz Tughluq had about 70,000 slave-artisans according to 'Afif, quoted in 'Irfan, Habib, *Cambridge Economic History of India*, vol. I, pp. 90-92.

34. For tenth century evidence, see Al Muqaddis's remark that a tax of 12 dirham was levied on each slave imported into Central Asia in H. C. Verma "*Trade Routes*". . . . p. 252. Later Ibn Batuta and the Dabarnamah also mention the the export of slaves to C. Asia. In fact, according to Ibn Batūta the name Hindu Kush was derived from the fact that Hindu slaves died of cold while crossing these mountains. (*Rihla*) . . . .

35. Pinder-Wilson, R. H. "A Persian Bronze Mortar of the Mongol Period", *Proceedings of the 25th International Congress of Orientalists*, Moscow, 1960. II, pp. 204-206.

36. Clavijo : *loc. cit.*

37. Probably picked up from the Chinese, see Needham : *The Grand Titration*. Allen and Unwin London (1972) pp. 101-105 see also Wulff : *Traditional Crafts of Persia*, M. I. T. Press (1966), pp. 6-8.

38. Le Strange : *Lands of the Eastern Caliphate*. pp. 40, 458-59, 464, 488; Mustaufi, *op. cit*; *Ain* ... (tr) Jarrett, Vol. II, p. 183.

39. Spuler in Richards (ed.) : *Islam and the Trade* of Asia, pp. 11-20.

40. On the import of raw materials, see Goitien : *Studies in Islamic History and Institutions*, Leiden, 1966, pp. 279-295; Simkin : *Traditional Trade* . . . .; Bernier : *Travels* . . . .; Jenkinson in *Purchase* . . . . Vol. XII; Manrique; Travels . . . pp. 240-41; Jamāluddīn Anjū, *Farhang-i-Jahāngīrī* : according to Portuguese sources, copper worth 100,000 cruzadose could be sold at Cambay in a day i.e., an annual intake of approx. 2098360 kg., See Mathew : *Portuguese Trade with India in the 16th Century*, Manohar (1983), pp. 146-147. On the Prices of copper in Mughal India, see Irfan Habib's chapter on the Monetary System in *Cambridge Economic History of India*, I.

41. *Ain* (ed.) Naval Kishore, Vol. I, pp. 38-39.

42. See this author's article 'on the identification of some C. Asian Alloys . . . . 'Indo-Soviet Seminar' . . . Nov. 1981.

43. *Tārikh-i-Firishta* (ed.) Naval Kishore; *Wealth of India*, Vol. I.

44. While dealing with Kashmir, this book referes to the Yārkand jug, the Kāshghar bowl, the Samarqand coffee-pot and the Bokhāra jar. Percy Brown and Watts : *Arts and Crafts of India*, Cosmo reprint. pp. 17, 31, 35, 36.

45. *Tārikh-i-Kashmir* (Aligarh MS) quoted in Rahmān and Ghouri, "*Paper Technology* in Medieval India" *Indian Journal of the History of Science*, Vol. 1 (2) pp. 133-147.

46. F. Braudel : *Structures in Everyday Life*, Collins, London, 1982, pp. 375-377.

47. *Adāb ul-Harb* . . . ed. by A. S. Khwansari, Eqbal Pubs, Tehran (1346 A. H) pp. 147-8.

48. Vide, Storey : *A Bio-Bibliographical Survey of Persian Literature*, Luzac, 1972, Vol. II (i) p. 141; Numerous other such accounts e. g. the *Safar Nāmah* of Piri Rais, the *Jahān Nāma* of Haji K͟halīfa (Tashkent MS No. 713), the *'Ajāib-ul-Tabqāt* are worth exploring.
49. See *Makātībāt-i- Rashidi* ed. M. Shafi, P. E. C. Lahore, 1947, pp. 286-9.
50. *Rihla, Loc. cit.*
51. For an interesting point on match-locks, see Zamān, M. K. "*Mughal Artillery*" I. A. Ḍ. Pubs. Delhi, (1983), pp. 26-27.
52. An outstanding manifestation of "transfer of technology—via—migrant nobles" factor. For details see Alvi and Rahman, *Saha Faṭhullāh Shīrāzī* . . . . I. N. S. A. (1968).
53. Vide J. Piazkowshi : "The Technology of Gun-casting in the Army of Mohd. II in *Proc. of the International Congress on the History of Islamic-Turkish Science and Tech*, 1981, III, 163-170. Compare with the details in the *Ain-i-Akbarī* (Persian edition by Nawal Kishore) Vol. I, pp. 144-5.
54. *Bābārnāmah* (tr) Beveridge, II, 536-537.
55. *Adāb ul Harb* . . . . p. 423-424.
56. I am grateful to Prof. Athar Ali, an expert on Turanian nobility, for this information (personal communication).
57. Fakhri Mudabbir, describes the shattering of the mirror-like elephant head-piece by a Bokhari archer using his tempered steel arrow. *Adāb* . . . f. 98 (BM MS. copy). On the diffusion of gunpowder technology and all the related Persian, Sanskrit and other sources, see Iqtidār Alām K͟hān "The Coming of Gunpowder and Response of the Indian Polity" (cyclostyled) lecture, Department of History Library, Aligarh.
58. For details see Latham and Paterson (trs) *Saracen Archery* (translation of a 14th cent. Bukhara Archery manual entitled Ghunyat . . . British Museum MS).
59. The earliest literary reference to the stirrup in India, though not of iron but of gold is found in Someśvara's *Mānasollāsa* of c. 1130 A. D. vide P. K. Gode, "The History of the Stirrup in Indian and Foreign Horsemanship . . . . ", *Studies in Indian Cultural History*, Poona 1960, Vol. II, pp. 71-80.
60. I am grateful to Douglas Streusand of University of Chicago for the references to Werner and Nef. On diffusions of technology see Irfan Habib : "Technology and Social Change in The 13th and 14th centuries" Proc. Indian History Congress, Varanasi, 1969; Lynn-White Jr. *Medieval Technology and Social Change*, Oxford, 1962, Qaiser, A. J. : *Indian Response*. . . Oxford, 1982.
61. Vide Forbes *Studies in Ancient* Technology, Laiden, VIII, p. 272.
62. See Zhdanko's article on this tribe published in the *Proceedings of the 25th Int. Congress of Orientalists*, Vol. II, pp. 176-182.
63. See Goitien : *Studies in Islamic History* . . . . pp. 256-278.
64. Habib, Irfan : Paper on Medieval Technology and Society presented at the Symposium on Technology and Society at Waltair Session of the Indian History Congress (1979). See also for earlier references article by F. R. Allchin on the distillation apparatus in Central Asia. Vide, *ISIS Cumulative Index*.
65. Irfan Habib, *op. cit.*, ff.
66. I am grateful to Mr. Ishrat Alam, research fellow in History at AMU for allowing me to consult his M. Phil. dissertation entitled *Textile Technology in Medieval India*" and for the references used herein.
67. *Tārikh-i-Firishta*. Kalhana's *Rājataraṅginī* (ed.) Stein of the *Tārikh-i-Kashmīr* (Aligarh MS).
68. For conditions in 19th cent. c. Asia see Mohal Lal, Schuyler Burnhs Moorcraft and Trebck : *Travels in the Himalayan Provinces* . . . New Delhi (1971). This book is also useful for Kahmiri crafts.

APPENDIX I

Some of the sources worth mentioning are the *Kitab..al Hind*, the *Kitab al Jamāhir..* and the *Kitab us Saidnah* of Al-Bīrūnī, one of the greatest scholars produced by Central Asia (who wrote in Arabic). Amongst the encyclopaedias and books on mineralogy, the *Arais ul Jawahir fi Nafais ul Ata'ib* of Abū'l Qāsim (c. 1310), the Bayn-us-Sana'at of Ishbilli (c. 12th cent.), the *Majmua't us Sanai*[1] (16th cent.) the *Jawāhir nāma of Mohd.* As͟hraf bin Asad (c. 1530), the *Jawāhir ul 'Ulūm-i-Humāyūnī* of Fāzil Samarqandī (c. 1550) the *Ā'in-i-Akbarī* (c. 1595), etc. The works of Ras͟hīduldīn Fadlullāh e.g. the *Jāmi'-ut-Tawārik͟h* (c. 1300) and other royal memoirs such as the *Tuzuk-i-Jahāngīrī* and the *Bāburnāma* (c. 1530) also give us information of technological importance. Amongst the travellers one must mention the works of Idrisi (*Kitāb Nazhat-ul-Muhstāq..*), Kustaufī (*Nazhat-ul-Qulūb*), Shihabuddīn al-Ularī (*Masālikul Abṣār fi Mamālik ul Amṣār*), the *Hudūd ul-'Ālam*, Marco Polo (Travels....), Blavijo (*Embassy to the Court of Tomerlane*) Ibn Baṭūṭa (Rihla), Nikitin (the well-known Russian traveller), together with the works of Abdurrazaq, Nicoli Conti and Santo Stefano the Genoese. Other European travellers which come to mind are Jenkinson, Varthema, Payton and Bernier. In the 19th century there is a virtual rush of Russian, British (and their Indian agents) and German travellers interested in assessing the 'colonial potential' of this region. Burnese, Sykes, Mohal Lal and Schuyler provide interesting accounts.[2]

There are also several Sanskrit sources belonging to the 10th-14th centuries which deal mainly with iatro-chemical procedures. The *Rasaratnasamuccaya*, the *Rasaratnākara*, the *Rasarṇavakalpa* deal mainly with vegetable drugs and such sources are numerous. But works such *Dravyaparikṣā* and as the *Dhātu Utpatti* of Thakkur Pheru[3] true works on technology written by an assay-master of Qutbuddīn Mubārak Shāh of India (c. 1318).

Translations of Chinese accounts are to be found in Laufer[4], Breitschneider[5] and Needham[6]. Other translations are available those of "The Secret History of

[1]The number of copies and translations of such works all over the Islamic East illustrates the role played by these texts in the dissemination of technology.

[2]These 19th century sources along with the works of Becker : *Russia's Protectorates in C. Asia* and Kunitz : *Dawn over Samarganq* are excellent sources on the colonization of C. Asia.

[3]See Sarma, S. R. : "The Varṇamālika System of Determining the Fineness of Gold in Ancient and Medieval India" Paper based on the *Dravyapariksha*, read at the Fifth World Sanskrit Conference, Varanasi, 1981. See also P. C. Ray : *History of Indian Chemistry-Ancient and Medieval*, Calcutta, 1923.

[4]Laufer, B. : *Sino-Iranica-Chinese* Contributions to the History of Civilization in Ancient Iran, Chicago (1913)

[5]*Medieval Researches from Eastern Asiatic Sources*, Vols. I and II.

[6]Science and Civilization in China, Vols. I-V, Cambridge University Press (1962).

the Mongols[7] (*Yuan Chao Pi Shi*) and the *Chau Ju Kua*, a trade manual of the 13th century which was translated by Firth. Mahuan is, of course, the author of the principal Chinese account of Indian coasts and commerce, but he is too remote for Indian-Central Asian relations.

One also cannot afford to ignore the oral traditions, folk-lore and ballads of the tribes in the trans Hindu-Kush/trans-Pamir traders, crafts and wars.[8]

The towering figure of the Russian historian and Orientalist. Barthold dominates much of modern work on Central Asia. Such recent works as the Cambridge History of Islam (Vol. V) and the Cambridge Economic History of India (Vol. I, edited by Roychowdhury and Habib) also contain incidentally, much that is of value for our theme.

The greatest contributions of the historico-ethnography as well as studies in the archaeology of Central Asia has been done by the scientists of the Soviet Union.[9] The works of Bongard-Levin, Belenitsky, Boroeiyer, Maruschenko, B.G. Gafurov, Selimkhanov, Prostov (and Fields in *Ars Islamica*) and the numerous other Soviet contributors to the various conferences and seminars especially the 25th International Congress of Orientalists, the Indo-Soviet Seminar on Exchanges in Science and Technology in the Medieval Period, 1981, the International Conference on Central Asia of 1969 (Proceedings edited by A. Guha), etc, may be hurriedly enumerated.

[7]In the introduction Mohd. Habīb lucidly explains the early history of the Mongols, Aligarh (1951).

[8]See study on Khattaka JASB XXXI (1862) by Raverty, quoted by Verma, H. C. in *Medieval Routes to India-A Study of Trade and Military Routes, Naya Prokash*, Calcutta (1978), p. 55n.

[9]Additional Material to the Historico-Ethnographic Atlas of Central Asia and Kazakhstan, Moscow (1961).

PRE-INDUSTRIAL INDIAN TEXTILE TECHNOLOGY AND CENTRAL ASIAN INFLUENCES

LOTIKA VARADARAJAN

In this paper an attempt will be made to differentiate what may have constituted the kernel of pre-industrial textile technology in India traditions based on different techniques. In earlier times the Himalayas and Pamirs did not constitute impermeable barriers to communication. There was fruitful trade with the Khanates of Central Asia in the course of which trade routes passing through Kashmir played an important role. The most important innovation in loom technology — that of the drawloom came to India through the Northwest. Since the basics chronology is that of the mediaeval period it is very difficult to define the cultural contours to be assigned to Central Asia. Geographically, in present times, this is taken to include the area comprising the Kazakh, Kirghiz, Tadjik, Turkmen and Uzbek Soviet Socialist Republic of U.S.S.R. However, from the point of view of diffusion of textile techniques and technology within the set time-frame, the American Soviet Socialist Republic cannot be excluded from this grouping.

The Survey is initiated with a description of various fibres used in India with their corresponding techniques of processing. This is followed by an appraisement of developments in loom technology. The last section covers procedures adopted in the dyeing of woven fabric. Floor coverings such as *kilims* and carpets have been excluded from the ambit of this article, as both require independent treatment.

In view of the ethnic diversity of the population, the length of its recorded history and the wealth in raw materials available, India has developed a variety of garment, drapery and packing materials, not to speak of accessories such as string, fringes and cording. However, unlike Africa and the Pacific Islands, India has had no major tradition of bark cloth.[1] Baste fibres, other than linen obtained from flax, were known. Sparingly viewed in weaving, their prime utility appears to have been diverted towards the manufacture of rope and twine.[2] Despite the low levels of pre-industrial technology, it is evident that difficulties inherent in the separation and cleansing of *baste* fibre had been surmounted. Felt is in isolated evidence in wool manufacturing centres, the *namda* of Kashmir and Kutch. Owing to climatic conditions in this country this fabric has been marginally exploited and has failed to achieve the heights attained in Central Asia. Deer and tiger skin are associated with conditions of asceticism and mendicancy. Silken, cotton, and to a lesser extent, woolen fabrics are the textiles *par excellance* of India.

Owing to geographical factors. wool, over the major portion of India. is of interior quality. In Kutch and Saurashtra, although the wool is rough, very pleasing items of variegated design in polychrome hues continue to be woven. The most sophisticated development is evidenced in the *Kani* shawl of Kashmir, presently woven at the village of Kanihama outside Srinagar. The shawls woven prior to the advent of chemical dyes in Kashmir[3] bear witness to the levels attained in the field of the dyers' art.

Silk, like wool, was considered a ritually pure fabric in pre-Islamic India. It could be worn without prior laundering for participation in public and domestic rites.[4] Bengal was the centre for mulberry silk tradition in the mediaeval period. Apart from the filament of *Bombyx more* (worm feeding on mulberry), localised to British Indian Bengal and small pockets in Assam[5] other kinds of silks, categorised as wild silks, enjoyed a wider geographical dispersion. These included *muga* and *eri* found in Assam, and *tusser* woven in Bengal, Orissa, Bihar, Andhra Pradesh.[6] *Muga* could substitute for *zari* (gilded silk yarn used in weaving and embroidery) in woven and embroidered fabrics in Bengal.[7] Wild silks are generally not associated with developed skills and techniques in the fields of dyeing or weaving.[8]

Mulberry silk with its superior qualities of lustre, tensile strength and affinity to dye lends itself to quality weaving and dyeing. The *kinkhab* (brocade), *gajji* (satin) and *patola* (double ikat)[9] of Gujarat as also the silk woven in Dharmavaram (Andhra Pradesh) and Kanchipuram (Tamil Nadu) were made of mulberry silk. Bengal could not meet total requirements of mulberry silk within the country and the shortfall was made good by drawing on the resources of China and Persia.

What were the loom traditions which governed the manufacture of silk and cotton in India? The basic loom appears to have been a horizontal counterbalance treadle loom.[10] Its historical evolution is far from clear. It has been pointed out by H. H. Risley that in Bengal the terms warp, weft, shuttle, loom were largely derived from Sanskrit while others such as those for reed and spinning wheel were generally Persian.[11] Despite the ambiguities inherent to linguistic evidence, it is to be noted that the loom used in Patan for *patola* weaving has no treadle machanism.[12] (Fig. 1). The South Indian loom does not differ basically from that of the north. However, it appears rooted in an earlier prototype with an orientation towards warp ornamentation.[13] In the absence of a reed, (see Fig. 2) predominance of warp over weft would have been inevitable in earlier times.

Ornamentation on the loom in India has been traditionally associated with three different methods of patterning. Supplimentary weft ornamentation is accomplished by counting and manually lifting warp threads as in *Jamdani* weaving (Fig. 3) associated with Tanda (Uttar Pradesh), Dacca (Bangla Desh) and Venkatagiri (Andhra Pradesh). The interlock technique is one in which single weft spools of different colours interlock either around a common warp and or around each other

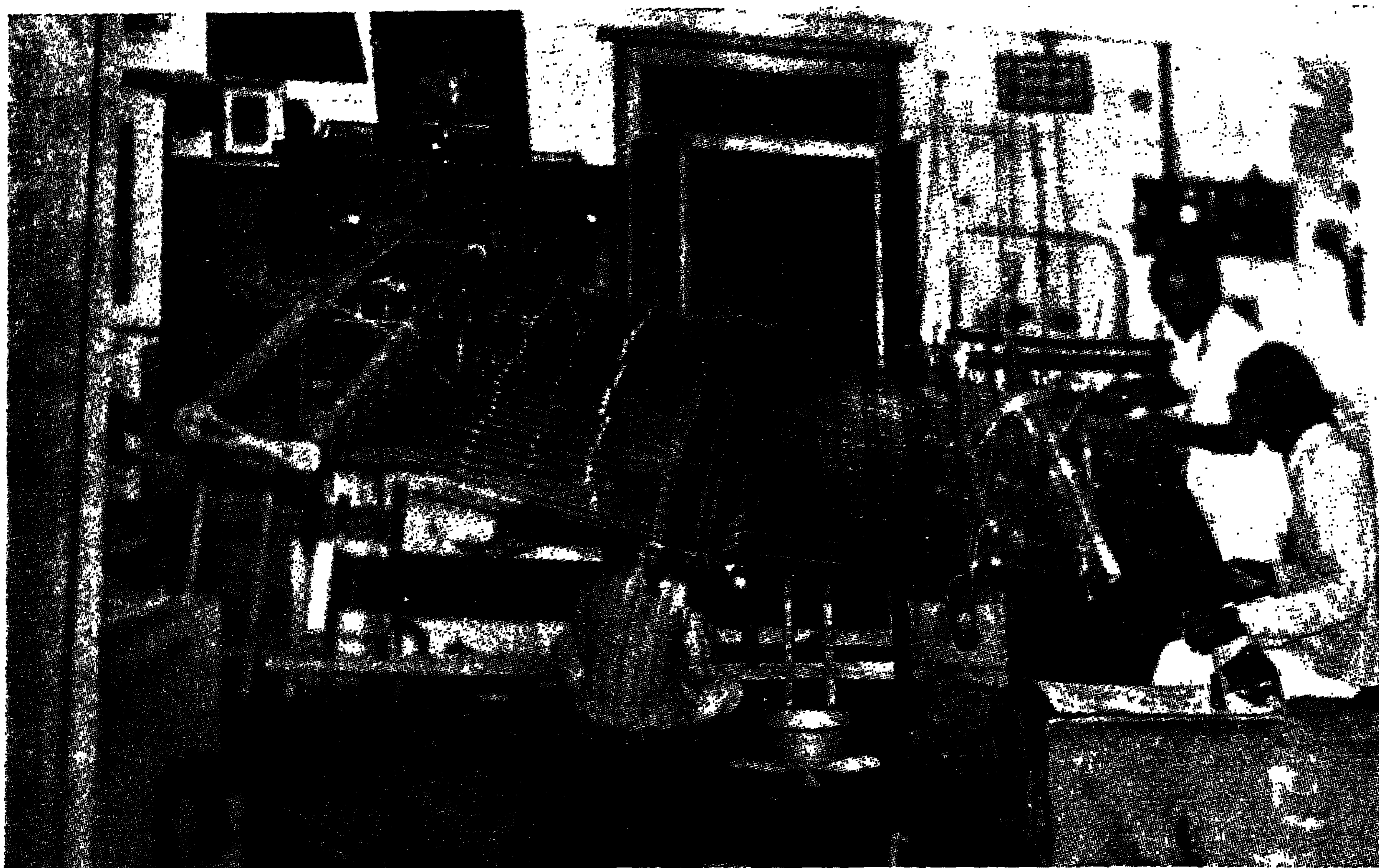


Fig. 1. Patola Loom—Workshop of Sri Chotalal M. Salvi, Patan.

at colour junctions, the warp ends, as in *Jamdani,* being manually counted and manipulated according to pattern (Fig. 4). A similar technique is also used in items with fully contrasting borders woven at places such as Kanchipuram. When confined to saris with contrasting borders it is known as the three shuttle technique (Fig. 5). It may also be found in *pallu* (portion falling over the shoulder), ornamentation associated with saris woven at Ilkal (Karnataka). Dharmavaram and Narayanpet (Andhra Pradesh). The highest development of the interlock technique may be seen in the Kashmir woven shawl, the *Kani Pashmina,* (Fig. 6) and in the items associated with Burhanpur, Chanderi (Madhya Pradesh), and Paithan, Poona and Yeola (Maharashtra). The Kashmir loom has four treadles since the preferred weave is twill, but others being based on the tabby weave (Fig. 7), could be operated by two treadles.

Among the centres practicing the interlock techique, that of Kashimir appears to have been the most open to Central Asian influences. Sulṭān Zaīn-ul-'Abidīn (A.D. 1420-1470) of Kashmir is reputed to have introduced innovations based on his experiences in Central Asia. The exact input is not clear but appears to be related more to pattern and design than any technological device. According to Frank Ames. shawl collector, Paris, who made this verbal communication to the author, Sulṭān Zaīn-ul-Abidīn is said to have introduced usage of coloured spools, *Kani/Tili/Tojil,* into weaving. This is possible. In the Kulu

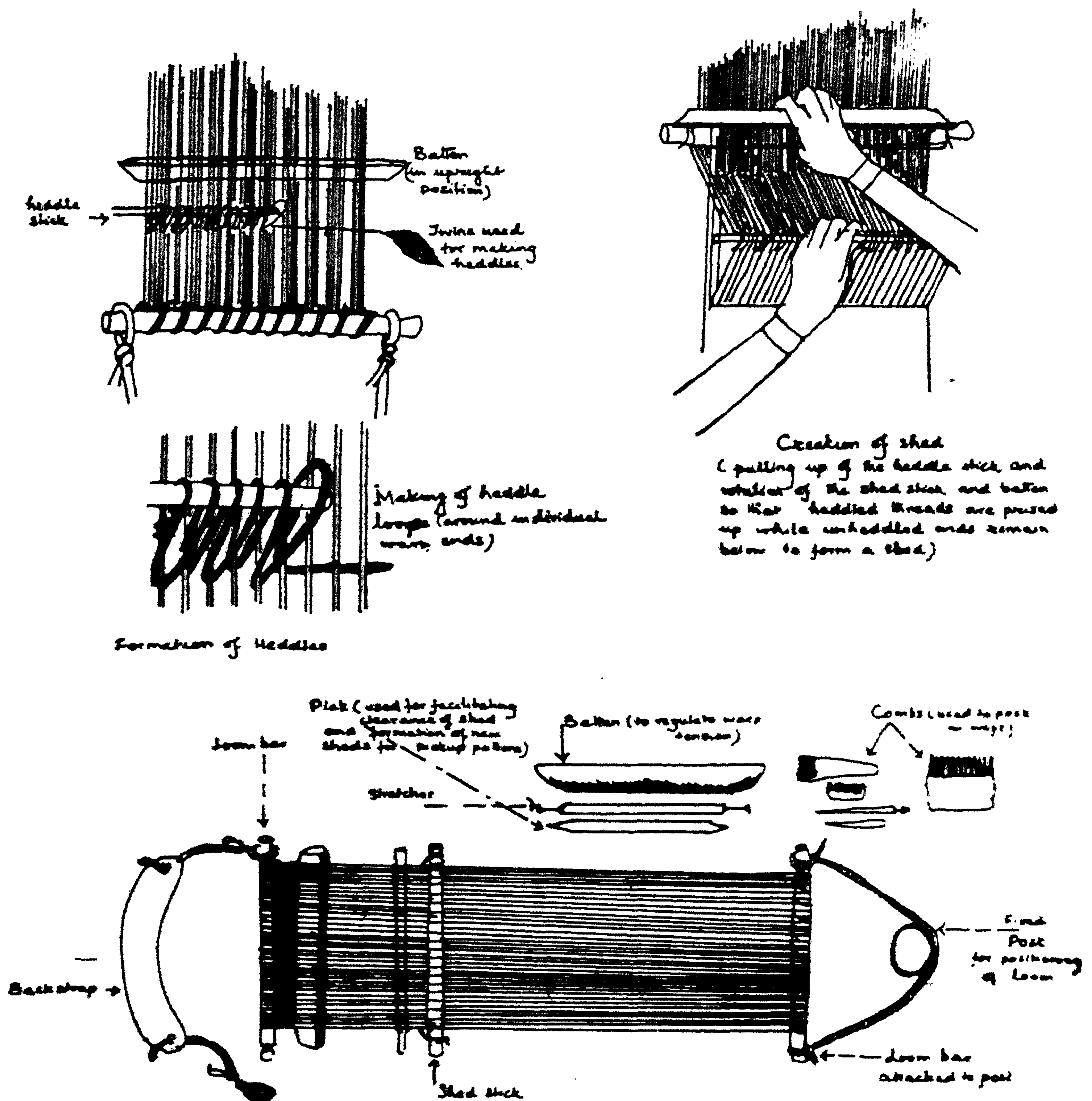


Fig. 2. Reedless Lion Loom –Work Principles

tradition in Himachal Pradesh where warp interlock (devetailing) is practiced, the coloured ends are left hanging to be used as required. At a later date the Moghul Emperor Babur (A.D. 1526-1529), is said to have imported weavers from Andizam (Kirghiz), who are said to have introduced the Kalga/Badam/Turnj/Paisely motif into the range of Kashmir double interlock weaving.[14] Without a deeper knowledge of Central Asian traditions of the period it is not possible to make a critical assessment of these statements.

The third method ef ornamentation is by means of the drawloom (Fig. 8), a later innovation associated with Islamic culture.[15] The drawloom involves a much

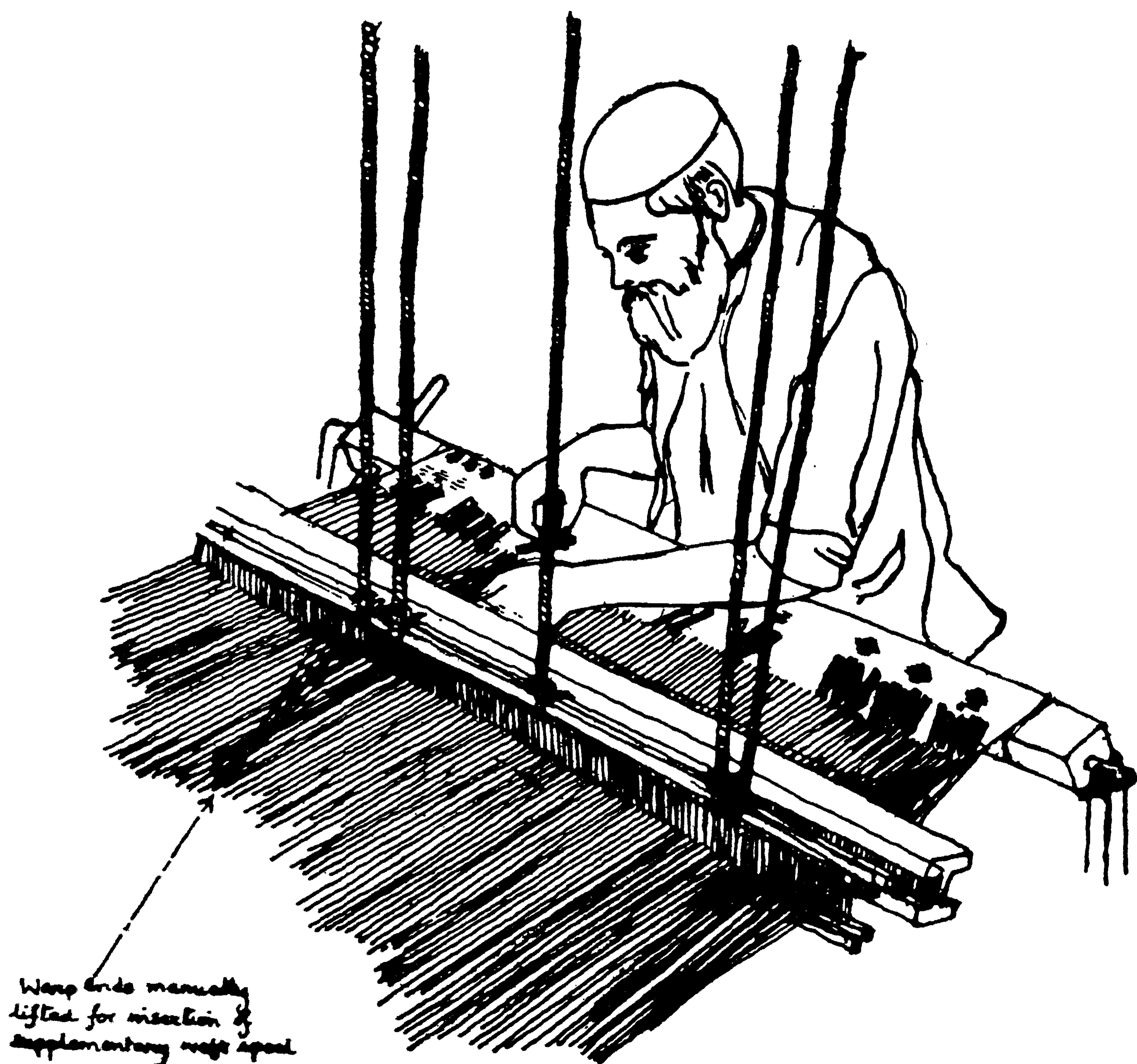


Fig. 3. Jamdani Weaving

more complicated arrangement for lifting or drawing up a warp threads than is the case in *Jamdani* and interlock, and the resultant weave is termed as extra weft or brocade (Fig. 9). The *adai*, the southern form of the drawloom, is rooted in an earlier tradition. Ornamentation in the Deccan was related to the three shuttle and weft interlock technique, apart from extra warp ornamentation for the border. Unlike the northern tradition, weft ornamentation in the south has been of a relatively simple order.[16] The machanism used for the extra warp ornamentation was turned at an angle of ninety degrees and redrafted according to the requirements of the weft patterning. The loom device for weft and warp brocade decoration was called *adai*. *Jhungu* was the name given to the tassel to which groups of warp ends were attached. By pulling individual *jhungu* the desired warp ends were attached. By pulling individual *jhungu* the desired warp ends would be lifted so that pertaining could be achieved by manipulation of extra warp ends, for the

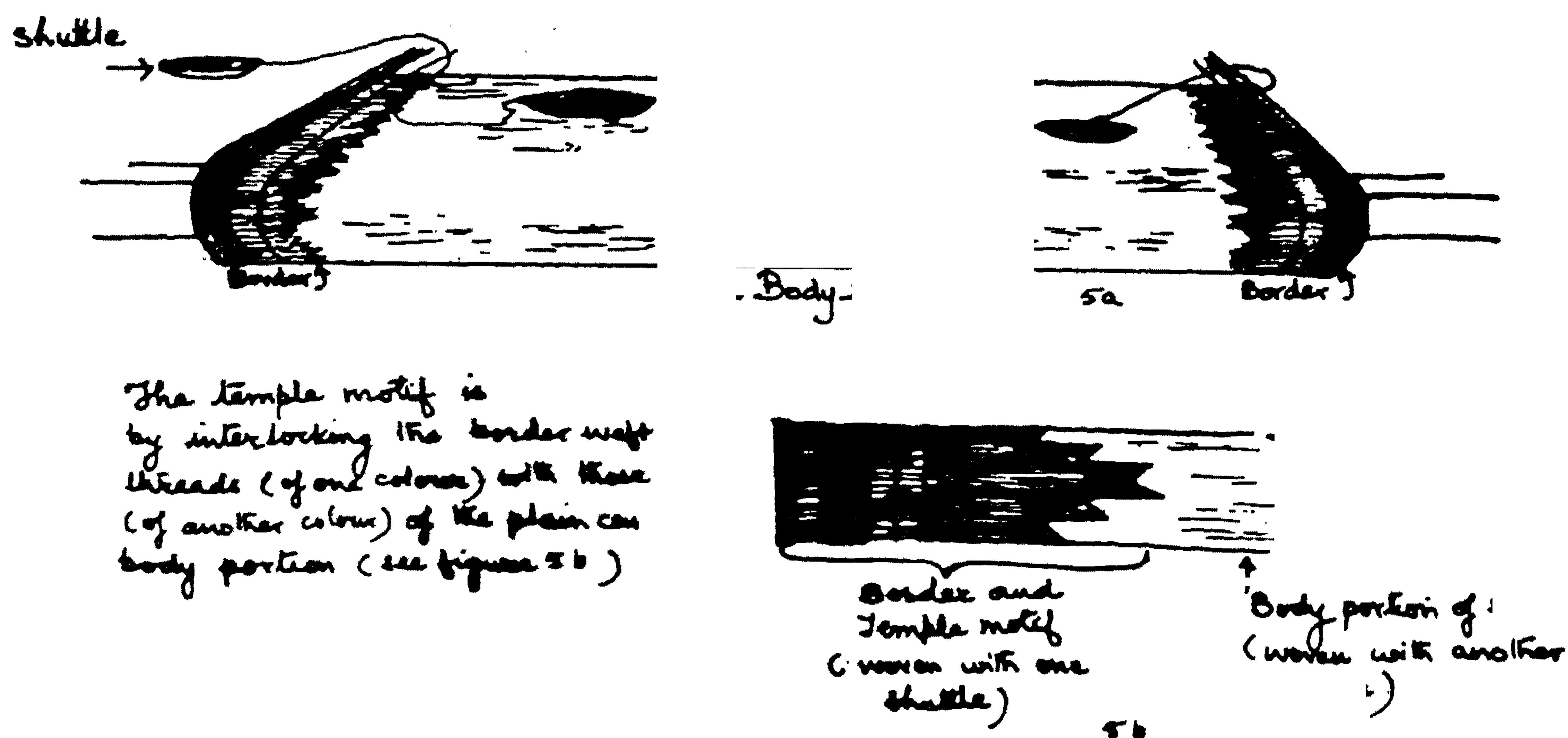


Fig. 5. Weaving of a 3 shuttle design with interlock technique. A three shuttle sari having the temple motif border : the borders on either end are each woven with a separate shuttle and the plain body portion requires another shuttle.

nor does it have the pleasing texture of wool. Patterning on cotton could best be secured by variation in colour introduced through the tabby or some other weave, or by dyeing the finished fabric.[18] The earliest methods of dye patterning were accomplished by resisting through the knotting of either the yarn (*ikat*) or the finished fabric (*plangi/banhani*) prior to processes of coloration. These techniques were also practised on silk. Additionally, cotton fabrics could be dye patterned either by means of painting (*kalamkārī*) or by stamping on mordant and resist with wooden blocks (chit).[19] The latter items were the most popular ones in the export trade. They were known as *sarassa* in Southeast Asia while European terminology converged around the word *chintz*.

The fabrication of cotton textiles was practised over a wide region in the mediaeval period. Syria, Persia, Central Asia,[20] Egypt (after the advent of Islam)[21] may be mentioned in the western sector. The dye patterned textiles of India were, however, of unsurpassed quality. Cotton, a cellulose fibre did not lend itself too easily to dyes which would prove colour and light fast. These results could be achieved only by securing changes in the chemical composition of the fibre. Very simple technology was evolved to secure these aims, the first procedures being those of dunging and tanning. The Indian tanning substance, myrobalam (*Terminalia Chebula*) was particularly efficacious.

The pre-Muslim colour range for cotton was based on variation of the following colours: white (achieved by bleaching through during[22] and exposure to sun, air and moisture), red (based on either *Rubia cordifolia*, *Morinda citrifolia* or *Ventilago madraspatna*), yellow (from turmeric, *Curcuma longa*, pomegranate rind,

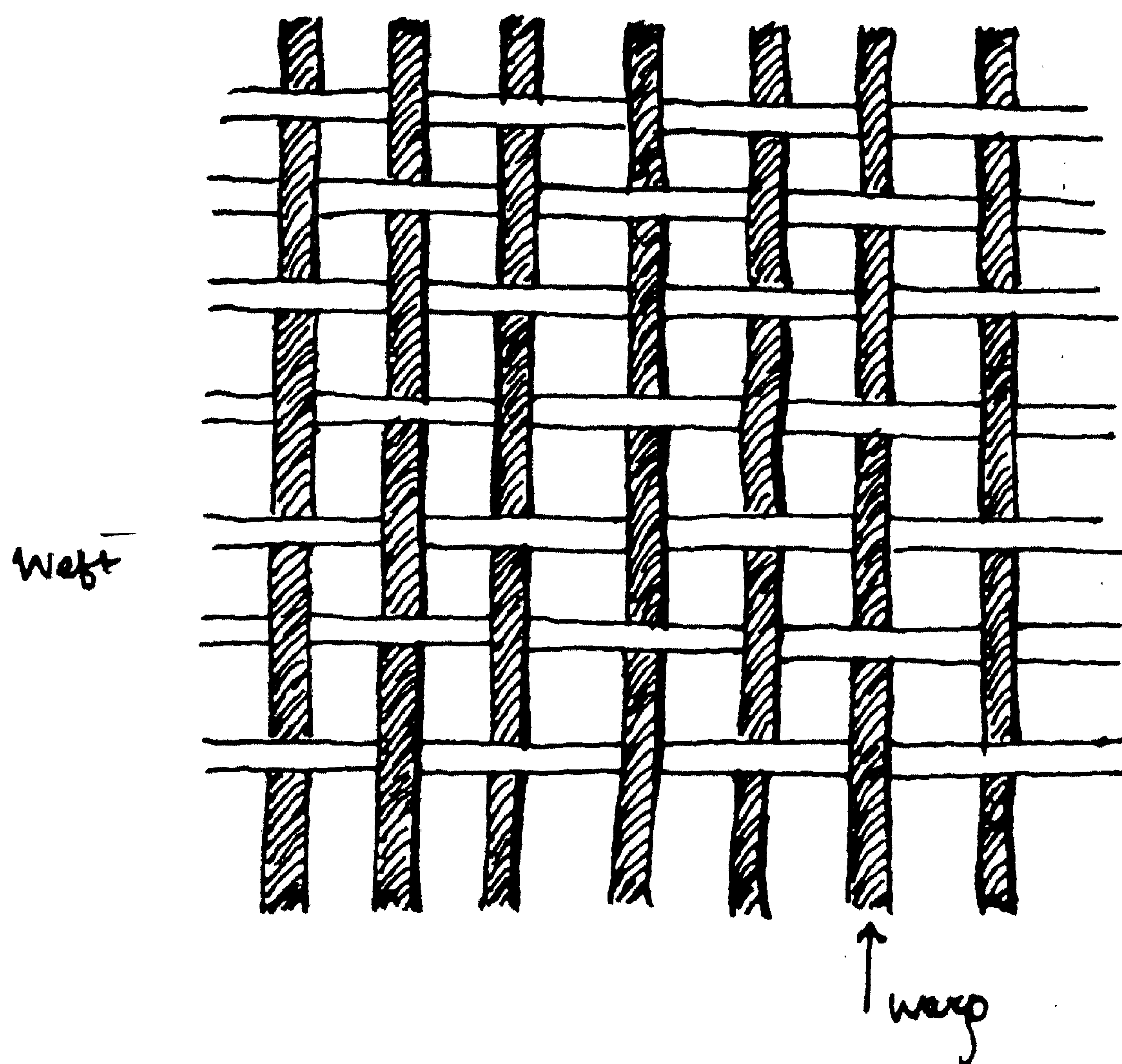


Fig. 7. The plain or tobby weave

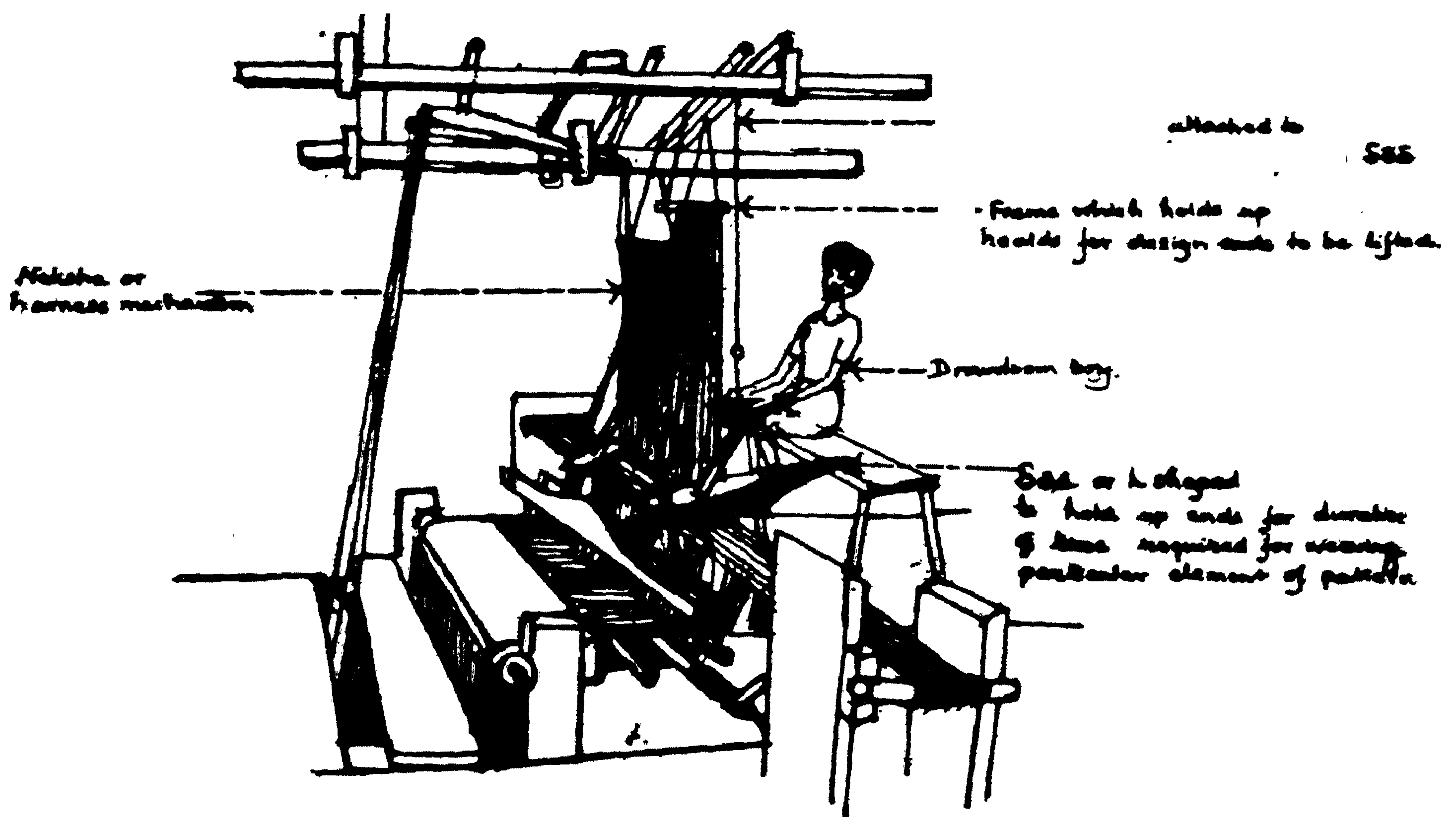


Fig. 8. Simplified diagram of Benaras Jala or Drawloom/Harness loom.

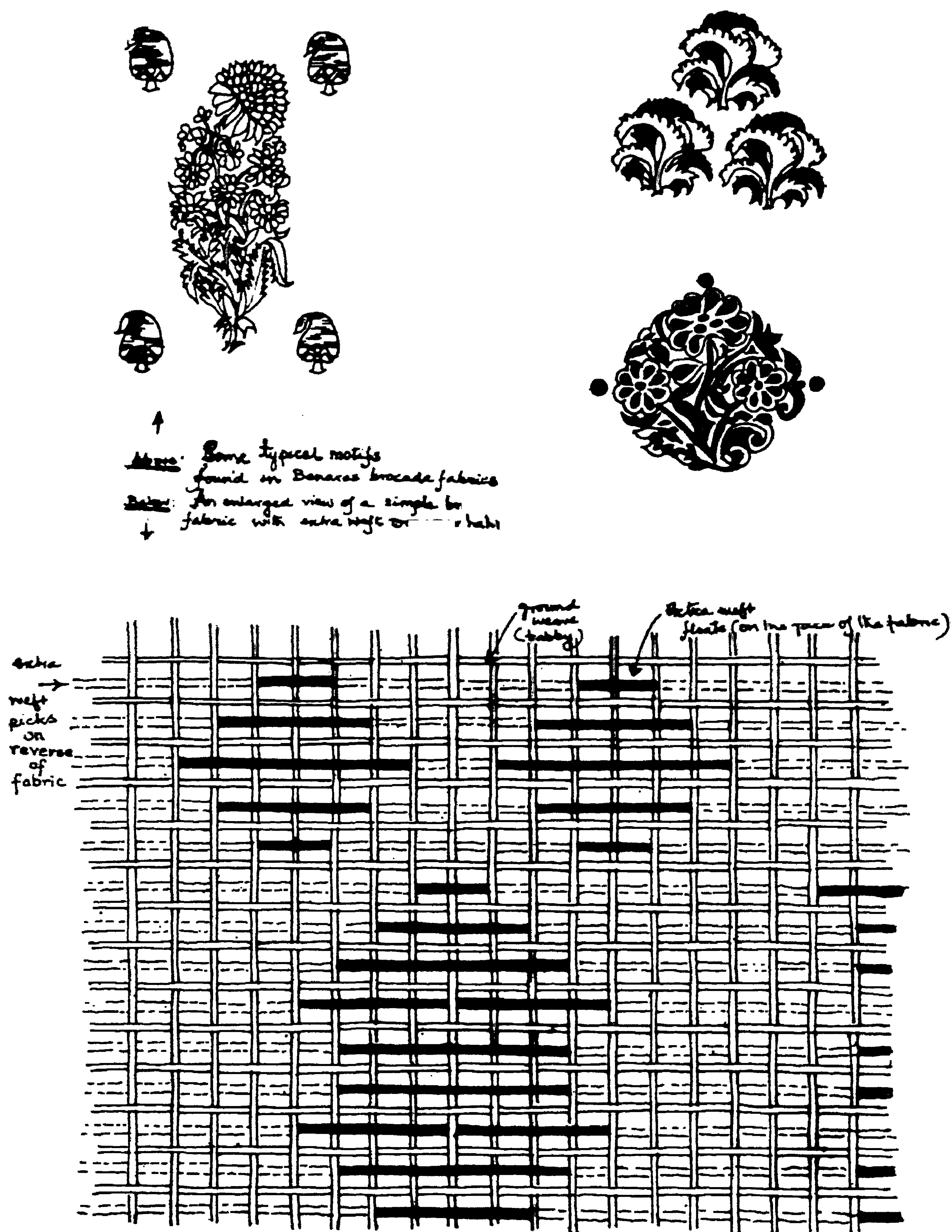


Fig. 9. Brocade weaving

substance to provide clarity in outline and ensure proper adhesion to the cloth. This had to be done without affecting the colouring agents. After the mordant had been absorbed the fabric was very carefully held in following water for removal

of gum prior to the initiation of the dyeing processes. Mud as a medium of resist and usage of block were in vogue in Gujarat but were absent on the south coast.

Although experienced artisans were quite familar with all the processes and techniques associated with the preparation of polychrome patterned cotton textiles, they made no attempt to systematise and record their knowledge. Apart from tanning, mordanting, resisting and preparing all the substances required for dyeing, they were also familiar with the function of carrier substances. Carriers such as *dhau flower* (*Grislea tormentosa*) and *jajiaku* (*Memecylon edule*) were intorduced during the process of madder dyeing in Gujarat and South India respectively to ensure even penetration of dye.

The major circulation of Indian textiles in traditional pre-European marts, particularly in Southeast Asia is associated with the advent of Islam. Arab enterprise led to a spurt of new urban settlements and centres of trade in West Asia and North and East Africa. The Central Asian Khanates absorbed fine cotton textiles used as turban cloth and perhaps as apparel material.[24]

The period between the seventh and seventeenth centuries saw the dominance of three sets of merchant middlemen in West Asia and in the arena of eastern trade. The earliest were in the Radanite Jews whose ambit of trade spanned the region stretching from the Mediterranean Sea to the land of Seres. After the absorption of Persia within the Arab Empire in A.D. 637 Muslim karımı merchants came to the fore. The earliest references to Karımı merchants is dated to *circa* 1120 A.D, and the last to *circa* A.D. 1475.[25] When the Portuguese came to India in the late fifteenth century they found that Armenians were very active participants particularly in north-western overland route.[26] Armenian activity declined only when the British became the dominant power in India.

Armenian presence of India is of interest from many points of view. Although members of this community adjusted extremely well to local mores and showed no evidence of missionary zeal in the furtherance of Orthodox Christianity, familiar links were extremely strong. Armenian repositaries in Erzerum and New Julpha in Isfahān would certainly have material of interest to India. A study of Armenian sources could also throw some light on the vexed problem of the origins of block printing. Block printing on cotton is in evidence in South Russia, Turkey and Iran. This author pleads total ignorance as to the South Russian traditions of printing and dyeing but would like to draw attention to a printed fragment at the Musee de l' Impression sur Etoffes, Mulhouse, said to be south Russian origin. Stamping by block for dyeing rather than pigment printing is dated *circa* sixteenth century in Turkey.[27] The earliest date for block printing of cotton in Iran could be perhaps be placed to somewhere around tenth century.[28] If the term *chimpa* be taken as synonomous with block printing in Gujarat, the reference to a guild of *chimpaya* by Hemachandra (born 1089 A.D) points to the existence of block prin-

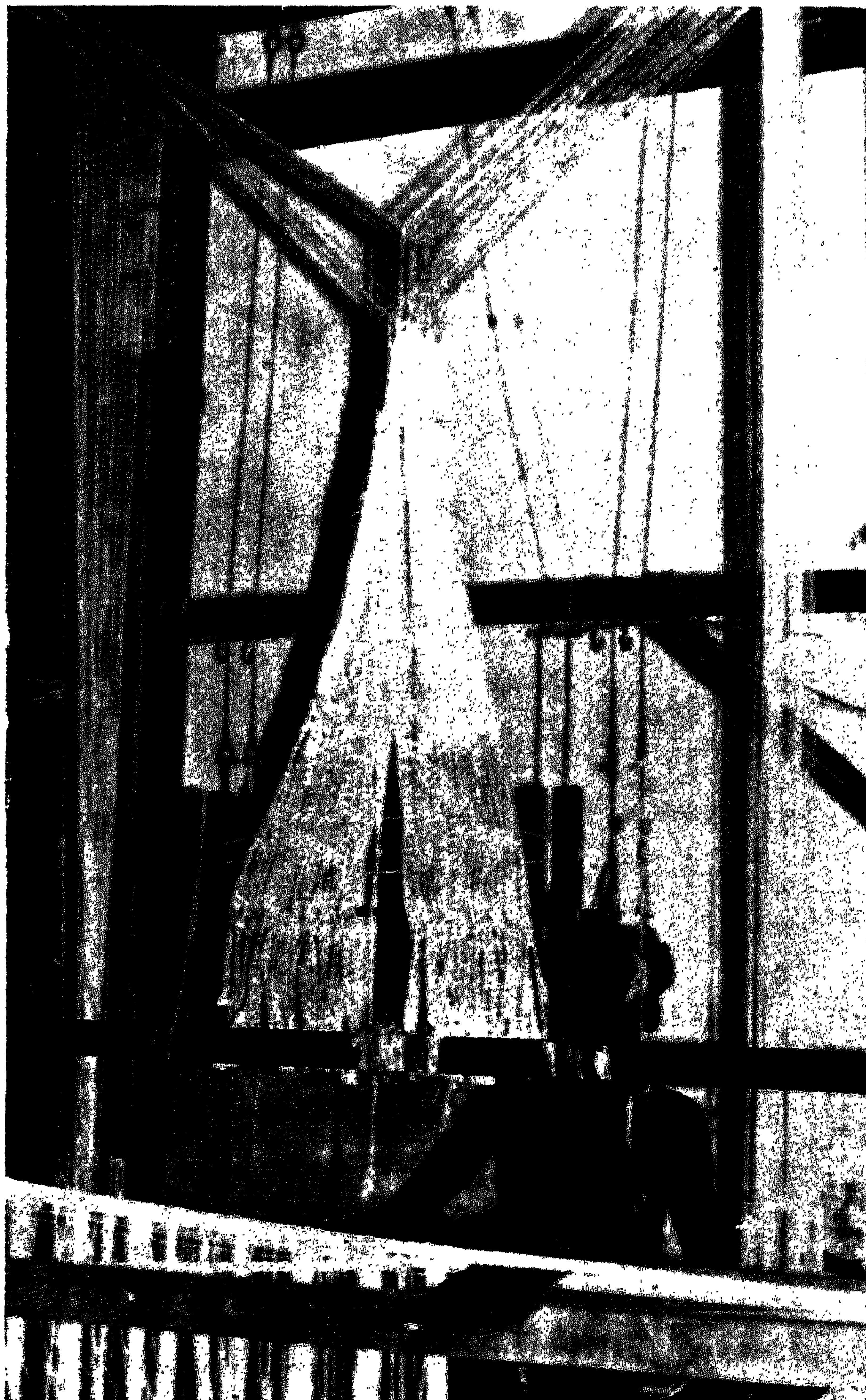


Fig. 10a. Weaver operating extra warp in *adai* loom.

ting in Gujarat prior to this date.[29] Merutuṅga who recorded conditions in Gujarat *circa* A.D. 884-1194 in his work, *Prabandha Cintāmaṇi* uses the work *chhimpikaya* with reference to a female dyer.[30] The earliest extent samples of block printed textiles of Gujarat are those dated to between the twelfth and sixteenth centuries, found at Fostat,[31] Egypt. In the seventeenth and eighteenth centuries a certain ambiguity came to be associated with the terms *persiennes* and *indiennes*, printed and painted cottons, in Europe. *Persiennes*, chintz from Persia were much more finely wrought than the *indiennes*, but whether they were made in Persia or constituted Indian goods were exported through Persia to avoid payment of customs duty in France is not clear.[32] From the time of S͟hāh ʻAbbās, Armenians dominated Persian trade through Levantine channels.[33] Moreover, when attempts were made

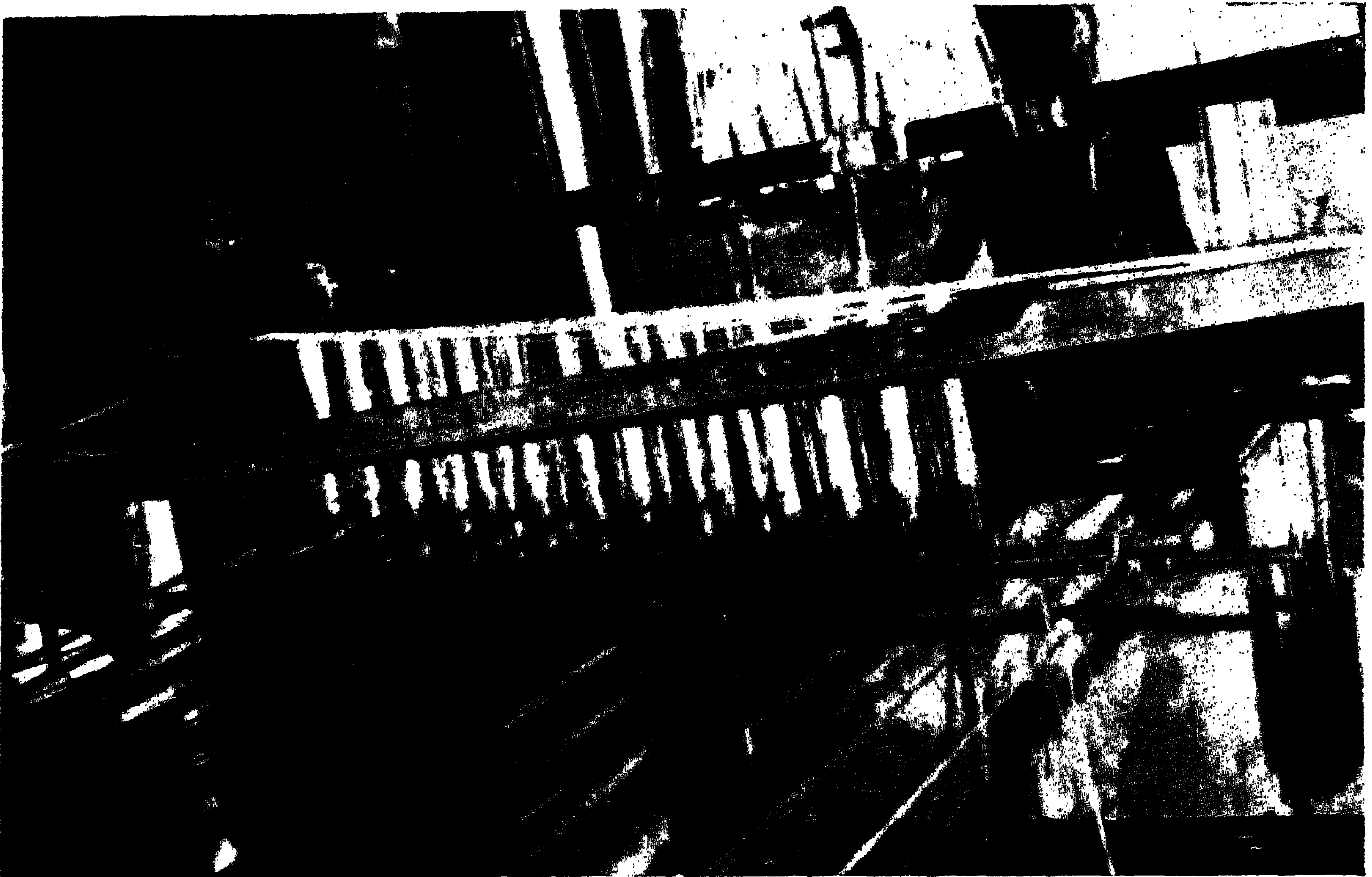


Fig. 10 b. Helper operating mechanism for extra weft in *adai* loom

to introduce Indian methods of cotton patterning in Europe, the artisans whose expert services were sought were not Indians but Armenians.[34] A study of Armenian sources would, therefore, perhaps prove even more rewarding than has been demonstrated in the case of the Jewish Geniza records. It would also serve to create some balance between the maritime sectors of trade about which so much is known, and the overland antennae particularly those linking up with Northwest Europe which represent virtually virgin fields of historial enquiry.

Acknowledgement

The drawings have been made by Ashok Rai, a graduate of National Institute of Design, Ahmedabad, now based in New Delhi. The technical illustrations have emerged from the understanding achieved as a result of discussions held by the author with Helena Perheentupa and Krishna Patel of National Institute of Design for permission to use this material which has been gathered in course of investigations for the project, "Traditions of Silk Weaving in India with special reference to the *Paithani* Interlocking Technique".

Notes and References

1. *Valkala*, a bark cloth worn by ascetics, is mentioned in the *Yājñavalkya-smṛti* and the *Mahābhārata*. Monier Williams, M., *Sanskrit-English Dictionary*, New Delhi, 1976, reprint, 1899, *Valkala s.v.*; Sardesai, N. G., Padhya, D. G. *Amara's Nāmalingānuśāsanam*, Poona, 1969,

p. 61. The *Yājñavalkya-smṛti* and *Mahābhārata* have been dated respectively to be between A. D. 100-300 (P. V. Kane : *History of Dharmaśāstra*, V. Part II, Poona, 1952, hence forth *Kane*, V) and between B. C. 4th century to A. D. 4th century (M. Winternitz : *A History of Indian Literature*, I, New Delhi, reprint, 1972, p. 465). A. Vaidehi Krishnamoorthy (*Social and Economic Conditions in Eastern Deccan from A. D.* 1000 *to A. D.* 1250, Secunderabad, 1979, p. 272), refers to a bark cloth, *potti* in usage in the districts of Ganjam in Orissa and Visakhapatnam in Andhra Pradesh. It is not clear if this has been confused with the woven *baste* fibre *pata*, which according to Professor R. S. Singh (Retired, Department of Rasa Shastra, Institute of Medical Sciences, Banaras Hindu University, Varanasi) is derived from a plant of the *Malvaceae* family, the fabric being called *patu*. At a much later date the Garo tribe of Northeast India received notice for the manufacture of bark cloth from the bark of *Phakram Grewia (leea) liliaefolia*, *Thewak*, a leguminous tree, *Phrap*, a Ficus, and *Chram*, an *Autocarpus*. See *Man*, 27, 5, 1927. Walker, G. D. "The Garo Manufacture of Bark Cloth", pp. 15-16. Vishnu Mittre : (Jain, S. K. ed.,) *Glimpses of India* Ethnobotany, New Delhi, 1981, "Wild Plants in Indian Folk Life – A Historical Perspective", p. 46), notes that in South India bark of *Antiaris toxicara* is soaked and beaten into cloth.

2. Such fibres are called non-spun *baste* filament, See A, Ling Roth : *Studies in Primitive Looms*, 3rd edition, 1950, Palifax, p. 11. The difference between such material and bark cloth is that the latter is beaten and stretched whereas the former is woven. There are references in European Company records to the weaving of a mixed cloth in Bengal, Orissa and Andhra Pradesh. The material appears to have been a mixture of *tusser* and some vegetable fibre. The latter is generally assumed to have been hemp, *Canabis sativa*, or jute, *Corchonus*. However, the possibility of *Boehmeria nivea*, where available, should not be ruled out. Boehmeria nivea was known as *Rhea* in Malaya, *Puya* in Nepal. According to E. Balfour, it was a native of Assam, China, and seemingly, of Japan, Java and Borneo. *Boehmerio puya*, Royle, grown in Darjeeling, Dehradun and other places in north India, from which *puya* fabric was woven, belonged to a different species but the fibre was very similar. The preparation of the fibre was a tedious process. The fibre derived from *Boehmeria Salicifolia* and *Bocchmeria utilis* was used for making cropes. E. Balfour : *Encyclopaedia Asiatica*, New Delhi, 1976, reprint, 1884 edition, II, p. 403; ibid., VIII, p. 403, However, both Francis Hamilton and W. Robinson assert that *Rhea*, categorised as *Urtica nivea*, was used in rope making rather than weaving. According to W. Roblnsonk was another species of *Urtica* called *ban Khua*, in local parlance, which was used in weaving cloth. Bhuyan, S. K. ed. : *An account of Assam with some notice concerning the Neighbhouring Territories. First Complied in* 1807—1817 *by Francis Hamilton*, Gauhati, 1940, p. 59; Robinson, W. : A *Descriptive Account of Assam*, Calcutta, 1841, p. 67; Forbes Royle, J. : *The Fibrous Plants* of India, London, 1885, p. 366. In Bengal and Orissa there was a cheaper variant of the silken ritual garment which was called *Patta vastra*. These are said to have been woven from jute in earlier times. Forbes Royle refers to saris woven from hemp in Bengal called *megili* or *megila*. These were more durable than those of cotton. He makes the interesting observation that Hindus engaged in the manufacture of jute while Muslims concentrated on the weaving of cotton. (*ibid*, pp. 248-249). *Patta vastra* continues to be manufactured today but the contemporary item is fashioned from rayon. Professor R. N. Dandekar (Bhandarkar Oriental Research Institute, Pune) in a personal communication to the author has stated that in Maharashtra a coarse silk or hempen ritual garment called *mukuta* is woven as a substitute for the more expensive silken item.

3. Lawrence, W. R. : *The Valley of Kashmir*, Srinagar, 1967, (reprint Oxford, 1895), p. 376; *Gazeteer of Kashmir and Ladak*, New Delhi, 1974 (reprint Calcutta 1890), p. 72.

4. Cotton had to be freshly washed each time after wear and for important rituals, to minimise pollution, it had to be worn while the body was still wet.

5. In British Indian Assam, mulberry silk was produced in Sibsagar, Darrange, Nowgong, Kamrup, Lakhimpur and Manipur. H. Maxwell-Lefroy and Ansorge, E. C. : *Report on an enquiry into the silk industry in India*, Calcutta, 1917, p. 159. For further details relating to silk in Assam see Geoghegan, J. : *Some Account of Silk in India*, Calcutta, 1872, pp. 16-17.

6. For further datails see Yusuf Ali, A. : *A Monograph on Silk Fabrics produced in the North-Western Provinces and Oudh*, Ahmedabad, 1974 (reprint, Allahabad, 1900), pp. 1-8. The Assam variety of *tusser*, produced in small quantities, was called *Katkari*. Basu, N. K. : *Assam in the Ahom Age*, Calcutta, 1970, p. 166.

7. This feature is in evidence in some of the monochrome embroidered *colchas* or quilts, in Portuguese collections such as those at Museu de Antiga. Lisbon and Museu Nacional Machado de Castro, Coimbra., in India, there is a very fine sample at the Calico Museum, Ahmedabad. See Irwin, J. and Hall, M. : *Indian Embroideries*, Ahmedabad, 1973, plate 23. In Bengal the term for cloth embroidered with *muqa* was *Kashida*. Ganguli, K. : *Designs Traditional Arts of Bengal*, Calcutta, 1963, p. 13.

8. The exception to this is constituted by the *ikat* tradition of Orissa originally woven in *tusser*. Mohanty, B. C. and Krishna, K. : *Ikat Fabrics of Orissa and Andhra Pradesh*, *Ahmedabad*, 1974, p. 16. In Assam muga is generally embroidered for ornamental effect. However, at Sualkuchi, 22.4 kilometres from Gauhati, elaborate designs are woven into this fabric.

9. With regard to affinity with Central Asia, single *ikat* has been associated with centres such as Samarkhand and Bokhara, although the colours and designs here appear dramatically different from those prevailing in India. There is also the mixed silk and cotton fabric, called mashru in India and *aladja* in Central Asia. Vambery, A (*Travels in Central Asia*, New York, 1865, p. 472), noted that in Khiva this was woven in cotton and raw silk, in Bokhara and Khokand of cotton alone. In India it is a warp faced fabric in satin weave, the warp being sink and the weft cotton. Ornamentation, to a large extent, was based on warp *ikat* in the past. For *mashru* see *Census of India*, 1961, V. Part VII-A, *Selected Crafts of Gujarat*, Delhi, 1967, pp. 55-60 and plates XII-XIV.

10. It was very similar to the Palestinian loom described by Shelagh Weir. See Weir Shelagh : *Spinning and Weaving in Palestine*, British Museum, London, 1970, plates 20-22.

11. Riseley, H. H. : *The Tribes and Castes of Bengal*, II Calcutta, 1981 (reprint 1891-92 ed.) p. 303, The treadle appears to have formed a part of the Chinese loom by the mid-second century A . D. In view of the access to China enjoyed by Bengal both by way of the north-eastern route to Yunan as well as the north-western silk route *via Uttarāpatha*, it is possible that this innovation may have reached India at an early period. It has been noted (H. Ling Roth : *Studies in Primitive Looms*, Halifax, 1950, p. 62), that the pit loom, the traditional Indian loom, is to be regarded as a manner in which aloom is worked rather than constituting a parameter in loom typology. Since the major spurt in Indian textile trade is associated with the rise of the Arab empire, innovation in loom technology may well be associated with the post seventh century period.

12. According to Krishna Patel (National Institute of Design, Ahmedabad), a further feature the *Patan* loom which has a bearing on Indian loom typology, is that structurally there is a resemblance between this loom and the back strap or loin loom, in usage in the Northeast region of India.

13. See Mazumdar, V. A. (ed) : *Indian Heritage*, Bombay, 1981, Varadarajan, Lotika "The Saga of Indian Textiles", p. 94. and n. 9. The most fertile development in weft ornamentation which has become integral to weaving tradition in Banaras and Gujarat, is associated with the introduction of the drawloom, which may be placed at a chronologically later date than that of the introduction of shaft and treadly loom.

14. Lawrence, W. H. *op. cit.*, p. 375; Lawrence refers to this motif as the *jigha*. For the technique of doubleinterlock used in Kani Pashmina see Lotika Varadarajan, "Kani Pashmina", to appear in Ray, Amita (ed) : *Niharranjan Ray Commemoration Volume*, (in press) Calcutta.

15. For the development of the Chinese and Syrian drawlooms see Wulff, H. E. : *The Traditional Crafts of Persia*, Cambridge, London 1966, pp. 174-175. Wulff traces the the Persian loom to the Syrian prototype. It was the Persian drawloom which was adopted in North India. European observers in Surat in the seventeenth century stated that Parsis were the best weavers in the region. It would be tempting to assume that when the Parsis were driven out of Persia in the seventh century A. D., they brought with them to their fresh homes on the west coast of Gujarat new skills in weaving including that of the drawloom. This would mean that the drawloow should have been introduced into Gujarat by the seventh century A. D. However, the Saurashtras, considered the best silk weavers in the South, according to community oral tradition, fanned out from their original home in Gujarat, subsequent to the sack of Somnath by Mahmud Ghazni in A. D. 1026. Saurashtras use the south Indian *adai* in their silk weaving. Had they been familiar with the drawloom prior to their departure from Gujarat it would be reasonable to expect that the *adai* would have been displaced by the harness associated with the drawloom as the latter lends itself more easily to much finer workmanship.

16. The elaborate ornamentation in the so-called South Indian temple saris, according to craft tradition, was a later introduction.

17. Comparable delicacy can, in theory, be achieved by means of the *adai* but the labour and craf input would neeed to be of a much higher order, The technical differences between the northern drawloom, the *Jala*, and *adai* will be discussed in greater depth in the proposed publication, Varadarajan, Lotika Patel, Krishna, *Indian Traditions of Silk weaving with particular reference to the Paithani interlocking Technique*. Work on this project, sponsored by the National Institute of Design, Ahmedabad, is in progress. Evidence gathered to date points to an independent origin for *adai* despite functional similarities between the *udai* of the south and the *jala* of the northern drawloom.

18. In the case of very fine cotton fabrics such as *Jamdani*, however, variation could be achieved by textural difference in monochrome colour as is in evidence in Tanda *Jamdani* weaving.

19. Technical terminology related to specific products is notoriously vague in vernacular languages. The term *Kalamkari* was adopted from Persian. Alternative nomenclature was development by other foreigners operating in India. The meaning given to the word *chit* in this paper is popular market term rather than that associated with any lexicon. For *Kalamkari*, see Varadarajan Lotika : *South Indian Traditions of Kalamkari*, Bombay, 1982.

20. Vambery, A. (*op. cit.*, *p.* 473) *circa* 1863. refers to "a kind of calico" of crude quality with a design of dark red fingures manufactured in Central Asia.

21. *Revue des Arts Asiatiques*, X, 1936, Pfister, R. "Materiaux pour servir aux classements des textiles Egyptiens posterieu a la conquete Arabe (y inclu) Tissus du Yemen", pp. 79-81; *Syria*, 1935; Wiet, G. "Tissus et Tapisseries du Musee Arabe du Caire", p. 284. Egypt had traditionally been the centre of linen weaving while Mesopotamia had devloped its expertise in wool. Ibid, p. 279 : Forbes, R. J. : *Studies in Ancient Technologies*, IV, Leiden, 1956, p. 160. Armenia had been a very important centre for textiles but Seljuk dominance *circa* 1075 had brought this to an end. *Arts Islamica*, IX Sergeant, R. B. "Material for the history of Islamic Textiles up to the Mongol Conquest", p. 58. Schwartz, P. R. (*Extrait du Bulletin de la Societs Industrielle de Mulhouse* No. 709, IV, 1962, "L. influence de I' Inde sur la Parse, les Indiennes et les Persiennes", p. 12), howerver, rejects the

hypothesia that Armenia could have been a centre for the production of painted and printed textiles.

22. Because of the leafy diet of animals, their excreta contains sodium carbonate, a bleaching agent, Lotika Varadarajan, *op. cit.*, p. 55.

23. Black could also be secured by repeated submersion in the indigo vat until the desired depth in colour had been achieved. The six colours cited above constituted the ones known at the time of the Mahabharata. This work is dated to the fourth century A. D. See Lad : *Archaeology and the Mahabharata*, Part I, Ph.D. dissertation, University of Poona, 1978, p. 221. In the 6th century Varahamihara his work the Brnat-Samhita refers to the preparation of fast dyes for textile fabrics by the treatment of natural days like *manjistha* (*Rubia cordifolia*) with alum and other chemicals also cowdung. P. R. (ed.) *History of Chemistry in Ancient and Medieval India incorporating the History of Hindu Chemistry by Acharya Prafulla Chandra Ray*, Calcutta, 1956, p. 103. The practice of these techniques and processes persisted into later times at important export oriented centres in Gujarat and South India. The reason for this continuity is the remarkable stability in colour which had been accomplished. With the advent of Islam a much wider palette came into more general usage. The most stable colours were those based on the above colouring agents. Others, as demonstrated at the dyeing centre of Sanganer, Rajasthan, tended to be fugitive. The introduction of such colours led to a curious social asage in Rajasthan. Fugitive (*kachha*) colours were associated with auspiciousness. Stable hues (*pakka*) were regarded as inauspicious, to be worn by widows. Since the predominant dyeing tradition in Rajasthan for garment accessories such as the *odhani*, and *pagari* has tended towards that of fashioning material in monochrome hues or by means of *bandhani*, redying of such fabrics would pose no major difficulty. The *odhani* is a female shoulder cloth and the *pagari* a male turban.

24. Cf. Rockhill, W. W. (trans, ed., with notes) : *The Journey of William Rubruck to the Eastern Parts of the World* 1253-1255 *as narrated by himself with two accounts of the earlier journey of John Pian de Carpine*, London, 1900, p. 70-71 : Morgan, E. D., Coote, C. H. (ed); *Early Voyages and Travels to Russia and Persia*, I, London, 1886, p. 88.

25. Holt, P. M., Lambton, A. K. S., Lewis, B. eds., *The Cambridge History* of *Islam*, IA, Cambridge, London. Melbourne, 1977, pp. 6-11, 223-226. For Radanite and Karimi enterprise see Goitein, S. D. *Studies in Islâmic History and Institutions*, Leiden, 1966, pp. 345-346; Fischel J. : *Jews in the Economic and Political Life of Islam*, London, 1937, pp. 73-78; Reinaud H. : *Geographie d' Aboulfeda*, I Paris, 1948, p. LVIII. For Karimi activities also see *Journal of the Economic and Social History of the Orient*, Fischel, W. F. "The Spice Trade of Mamluk Egypt", pp. 157-174; *ibid*, Goitein, S. D. "New Light on the beginnings of the Karim merchants", pp. 175-184.

26. In the East Armenians began to displace the Radenite Jews in the 11th century. Armenian business deals took place in the zone where the Muslim world and the Byzantine Empire met on the major route conneting upper Mesopotamia with Trebizond. Trebizond was an important entrepot for articles from the Levant and several fairs were held here annually Armenian movements carried them next to upper Mesopotamia and from there to Bagdad, where they grew into a considerable colony, They also reached Asia Minor and Constantinople where they became soldiers, architects and traders. At the time of the Crusades, *circa* 1069-1291 A. D. they dominated the trade of northern Syria of Lesser Armenia through the port of Ayas. They finally reached Egypt where the Fatimid vazir at the end of the 11th century, Badr al-Jamālī, was an Armenian. Badr-al-Jamālī attracted architects and businessmen of the same origin to Cairo. Maurice Lombard, trans. Spencer, J. : *The Golden Age of Islam, Amsterdam*, Oxford, New Kork, 1975, pp 212-213; Heyd, W. *Historie du Commerce du Levant au Moyen Age*, I, Leipzig, 1885, pp. 44-45; ibid., II Leipzig, 1886,

p. 92. In the mid-sixteenth century the trade in spices appeared to be dominated by them Armenian merchants bartering their ware with Venetians at Aleppo. Morgan, E. D. Coote, C. H. *op. cit,*, p. 149 n., II, p. 396. For 17th century Armenian participation in the trade of India and Tibet see *Journal of Indian History*, 1976, Gokhale, B. G. "The merchant community of 17th century India", p. 22; *Annales, Economies, Societes, Civilizations*, 1967, 2, Levon Kachikian, "Le registre d' un merchand armenian en Perse, en Inde, a Tibet (1682-1693)"; Guha A. (ed.); *Central Asia*. New Delhi. 1970, Gopal, S. "Armenian Traders in India in the 17th century", pp. 200-213 Mollat M. : *Societes* et *Compagnies de Commerce en Orient et dans* 1' *Ocean Indian*, Paris, 1970, Carswell, J. "The Armenians and East-West Trade through century", Persia in the XVII. pp. 481-485.

27. Pfister, R. *Les Toiles Imprimees de Fostat et* 1' *Hindoustan*, Paris, 1938, pp. 77, 81.

28. Landolt-Tuller A. and H. (*Qalamkar-Druck in Isfahān*, Basel, 1976, pp. 68-73), give details about a *futwa* pertaining to conditions of apprenticeship for block printing, *chitsaz*, in Persia. A very wide margin, anywhere between the tenth and sixteenth centuries, is provided for the dating of this document. The earliest wooden blocks to have been excavated in Iran and those found in Nishāpūr in association with 10th to 11th century pottery. See Gluck, J. Gluck, S. H. Penton C. J. (eds) : *A Survey of Persian Handicraft*, Tehran, New York, London, Ashiya, Jopan, 1977, p. 186.

29. Majumdar A. K.: *Chaulukyas of Gujarat*, Bombay, 1956, p. 264. When Muhmud Ghaznavi invaded western India in the early part of the eleventh century, among artisans he is reputed to have taken back with him were calico printers who are said to have started the tradition of block printing on cotton in Iran. Papillon J. M. : *Traite Historique et Pratique de la Gravure en Bois*. I, Paris, 1766, p. 66. This would fit in with the dates for the earliest blocks excavated in Iran, see above n. 28.

30. Majumdar, A. K. *op. cit.*, p. 262. *The Prabandha-Cintāmaṇi* was however, composed *circa* A. D. 1304 See also Thaker, J. P. (ed): *Laghu-Prabandha-Saṃgraha*, Baroda, 1970, p. 31. The date for the composition of this work is the latter half of the thirteenth century. *Ibid*, p. 91.

31. See Bhowmik, S. K. (ed) : *U. P. Shah Felicitation Volume*, Sayaji Rao Museum and Picture Gallery, Baroda, Lotika Varadarajan, "Fostat Textiles : Tradition and Continuity", forthcoming.

32. See *Gaixette das Beaux-Arts*, 1912, Clouzot, H. 'Les toiles peintes de 1' an pavilon de Mersan", pp. 288-289; *Extrait du Bulletin de la Societe Industrielle de Mulhouse*, No. 709, IV, 1962 Schwartz, P. R. :'L' Influence de I' Inde sur Ia Perse, les Indiennes et les Persiennes", pp. 8. 11-12, 14.

33. *Letters Edifiantes et Curieuses*, *Memoire du* Levant, II, lettre du pere Monier de la Compagnie, de Jesus au Pere Fleuriau de la meme Compagnie, p. 95.

34. *Memories de l' Institut Historique de Provence*, XVI, 1939, ler trimestre, H. Chobaut, "L' industrie des indiennes a Marseilles avant 1680", p. 88. The Armenians appear to have mastered the transfer technique developed in Iran.

CENTRAL ASIA AND INDIA : IMPACTS ON AGRICULTURE

LALLANJI GOPAL

The conservative character of the Indian peasant is proverbially well known. If we compare the state of agricultural technique in the ancient period[1] with the practice followed before the introduction of modern techniques a few decades back, not much scope is left for any significant change in the mediaeval period. As the evidence is not very vocal,[2] it is very difficult not only to determine the state of agricultural technology in the mediaeval period but also to identify the factors responsible for the changes. But the possibility of Central Asian influences is to be admitted and investigated. In the ancient period, Buddhism and trade relations were two channels of cultural exchange between India and Central Asia. In the mediaeval period, the contacts were far close.[3] The Turko-Afghan rulers had links with many parts of Central Asian regions. The Mughal emperors had their origins in Central Asia. The exchange of goods and people between the two regions, the reputation of Central Asia as a centre of culture, and the personal and emotional regard of the mediaeval rulers and chiefs for Central Asia, provided the necessary background for some Central Asian techniques even in the field of agriculture to be imported to India.

In the mediaeval period, there did not seem to be any significant factor providing incentive for introducing improvements in the technique of agriculture. The rulers did not make any efforts to increase the tax-paying capacity of the peasants. In the then existing political realities of the period, they chose to adopt a definite policy of leaving the peasants a balance enough for bare substance.[4]

Ālāuddīn's market regulations and his policy to keep prices 'low' and 'fixed' affected the peasant rather adversely.[5] The policy of keeping prices low, generally cripples the production and impoverishes the producer. We have evidence to indicate that such a policy was adopted by subsequent rulers.[6] Nevertheless, the State did not turn a blind eye to the welfare of the people.[7] The Sulṭāns and the Mughal emperors initiated measures which aimed at providing relief to the cultivators in times of extreme distress, such as drought and famine[8], although they did not introduce any significant change in the technique of agriculture which could have increased the average yield. Bābur, however when he ruled at Kābul, started sugarcane and banana plantation which yielded rich income.[9] Even in respect of the canal system, developed by the mediaeval rulers, the motive was seldom to extend cultivation; generally it was to provide 'a safeguard against drought and a means of improving the crops.'[10]

The Kushāna levels at Kaushambī and Hastinapur show several varieties of sickle and a distinct tendency for broadening the blades. Iron implements came in for a larger use.[10a] But there is not enough evidence to establish that Central Asian influences were the reasons for these changes.

In the absence of comparative demographic figures for different periods, we cannot determine the pressure on land. Even the evidence to indicate reclamation of new regions in the mediaeval period is wanting. 'Irfān Habīb[11] infers an increase in cultivation since Mughal times of which there were three main regions of the greatest increase, Allahabād, Oudh, Bihar and parts of Bengal witnessed reclamation of the Tarai sub-mountain forest, while Berar saw the clearing of the Central Indian jungles. Only in the Indus Valley, the extension was due to the new canal system. But, there was not a corresponding increase in the average yield of the land, on account of the practical absence of manuring.[12] Further, the extension of cultivation generally involved inferior lands which were uneconomical to sow, or the clearings in forests whose fertility was gradually reduced to the level of ordinary land.

The items for cropping and the technique of their cultivation do not show any remarkable change[13] which could be identified with any certainty, as the direct borrowing or influence of Central Asia or as caused by the personal interest or influence of the rulers.[14]

The very name *Kābulī* for a kind of gram (nakhūd) different form Hindī, mentioned in the *Āin-i-Akbarī* suggests its origin. The first known reference to a tax on maize (*makka*) belongs to 1664, but we cannot settle the question of its origin in India, because, though it is said to have come from America, it is known to have occurred in earlier times.[15] The importance of 'cash crops' of the type of modern terminology, was duly recognised. They are referred to as *Jins-i-kāmil* and *Jins-i-atā*, as contrasted with *Jins-i-adnā* and *jins-i ghalla* which mean crops fetching low prices and which include foodgrains.[16] They were raised mostly for sale, while the latter were mostly for local consumption. The absence of any explanation of these terms in contemporary literature implies that they were in general use and were clearly understood. *Khāfi Khān* mentions *Jins-i a 'lā* as 'sugarcane, etc.'[17] A late eighteenth century glossary of revenue terms includes sugarcane, betel leaf, cotton, etc. in *Jins-i kāmil*.[18]

Indigo cultivation, which died out after the introduction of synthetic dyes from Europe, was an important commercial crop cultivated with great care and concern in many parts of the country. Within the Mughal empire, three principal areas of high yields indigo were: Bayana-Doab-Mewat, Sarkheg and Sehwan.[19] Its cultivation did not clash with the pattern of *rabi* cropping as well as the interest of other crops. On the contrary, with its fertilizing properties, it had promoted the

cultivation of wheat, cereals and other crops. But apparently these advantages were not consciously realised by the cultivators.[20]

On account of the Central Asian influence. the medicinal use of some plants seems to have gone up.[21] Of these, the most notable is the *hennā* or *mehndi* which possibly came into popular use in the mediaeval period, the ancient literature of India was not at all aware of this dye-yielding plant.

New Plants:

Among the narcotic plants, opium and true hemp (*bhung*) were widely cultivated, though forbidden by imperial order.[22] Tobacco was introduced in the reign of Akbar by pilgrims returning from Mecca. It does not find a mention in the *Ain-i-Ākbarī*. During Jahāngir's reign, its popularity appeared to have affected other crops and the prohibitory imperial orders were abortive. Soon its use became fashionable with the rich and the poor alike. Manucii records its great consumption by the 'Mohomadans'. Its cultivation extended rapidly and, by the middle of the seventeenth century, it was grown in great quantity even in remote inland areas of the Empire.[23]

The cultivation of vegetables in areas near the town is a noteworthy development in the period.[24] The semi-urban towns, which arose around feudal chiefs promoted a greater use of vegetables. An imperial *farmān* in the eighth year of the regin of Aurangzeb records that 'officials and government servants grow in their gardens and those of the Crown (*sarkār-i-wālā*), every kind of vegetables and fruits and give them to the green-grocers at double the rates.'[25] European travellers make a special reference to the 'variety and abundance' of vegetables grown in India.[26] The period witnessed the introduction of potato and tomato, though not through the Central Asian source.

Manuring :

In ancient India, many types of fertilizers, including cowdung and excreta of animals, leaves, bone-powder and fish-washing, were known. But, the ordinary cultivator generally used only cow-dung and rubbish.[27] Considering the practice before the introduction of artificial and chemical fertilisers in modern times, we cannot expect much improvement in mediaeval times. Central Asia does not show a large and systematic use of special manures. We can postulate 'a more abundant supply of cattle manure' in the period, because of the larger *per capita* cattle population and easy availability of firewood.[28] But there is no indication that it improved cultivation in a noticeable manner.

Irrigation

In the mediaeval period also cultivators depended mostly on rains and the inundation of rivers. Bābur records that the Indians' need no water-courses to construct dams because their crops are all-rain-grown.'[29] 'Irfan Habīb explains

Abūl Faḍl's silence about the role of irrigation in the various provinces on the fact that the crops depended mostly upon rainfall and only partly on wells.[30] Sujān Rāi also opines that in Hindūstān 'most of the land is *lalmi* which is synonymous with *Barānī* (i.e. dependent upon rain), although he refers to land being watered by wells or inundations in some parts.[31] There is evidence to show that earlier under the Kushānas, irrigation received substantial fillip. In respect of the fields on the hill terraces, there were devices to channelise the rain water from the top fields to the bottom ones. On the plains, canals were dug and, if such canals could not be opened, large-size masonry walls were excavated.[32] One can expert Central Asain influence in these Kushāna activities.

Bābur has to be given credit for making use of the Persian wheel of Rahat in some of his irrigational works. He vividly describes all the essential parts of the Persian wheel as he found it being used in Lahore, Dipalpur, Sirhind and thereabout.[33] It would thus be clean that the device could not have introduced by him. Apparently he had not seen anything similar to it outside India and it was a novelty noticed in India.[34]

The Turko-Afghan Sultāns and Mug̱hal kings were alive to the irrigational needs[35] and paid great attention to the digging of canals. The first large-scale activity for irrigation has been recorded during the regin of Firuz Shah. Firis̱hta attributes to him fifty dams built across the rivers to promote irrigation, thirty reservoirs, one hundred public baths and ten public walls. The most important of these was a double system of canals passing through the vicinity of Karnāl and entering the city of Hissār Fīrozah one canal called *Rajurah* was taken from the Yamuna and the other called *Ulughkhānī* from the Satlej. A third canal terminated at the river Sarasvati. The fourth, the forerunner of the modern western Yamuna Canal, was the largest and came up to Hissar. The fifth connected the Sarasvati and Markand.[36] During the region of Akbar, the fourth was repaired and reexcavated twice by removing the silt, first by Sahabu-ddīn K̲han, who was taken Governor of Delhi and who renamed it as *Shihāb Nahr*, and later by Nūru-ddīn Muhammad *Tarkhan*, who named it after Prince Salīm.[37] Among the Mug̱hal kings, S̱hahjahan took great interest in the canals.[38] He repaired the silted Firuz S̱hah canal from K̲hidrabad to Safadon, then dug a new channel, seventy-eight miles long, which was named as *Nahr-i-Bihisht*, *Nahri-i-Fāid* or *Shāh-nahr* and this effort was 'something of an achievement' for its period, serving the needs of the new city of Shāhjahānābād.[39] Another *Shāh-nahr* in the Punjab was 84 miles long, and stretched from the Ravī at Rājpur to Lāhore. From Rājpur three other canals ran to Pat̲hankot, Batāla and Pattī Haibatpur.[40] There were canals in other parts of the empire. Some of these were excavated by government officials and chiefs.[41]

Not all the canals mentioned as having been dug by mediaeval rulers were new ones. Thus, Fīrūz Shah's canal was partly an old channel, which carried the

Chutang river to Hansi, Hissar and beyond, and had existed several centuries earlier, possibly since the eighth century.[42] Some of these canals were natural inudation channels, which are revived and sometimes extended. The silt was removed to put them back into regular use. The care bestowed on cannals has been indicated by along memorandum, drafted during the reign of Shāhjahān, for clearing and deepening the channel of the Chutang or Chitrang river so that its water would reach Hissar.[43] In the Multān *sarkār* a canal superintendent (*mir-i-āb*) was appointed to 'dig new channels' (*nāla*), clear the old channels, and erect bunds on flood-torrents (*band-i-sail*) and to distribute canal water equitably among cultivators.[44]

The canals, sometimes said to have been dug to populate a territory or to meet the needs of a city,[45] could not have been confined to the drinking needs. They are referred to as also being intended for irrigating the gardens,[46] or the fields.[47] The cultivation of wheat and sugarcane began in the area round Hissar and Fīrūzābād as a result of the canals of Fīruz Shāh.[48] The great benefit according to cultivation from the *Nahr-i-Bihisht* and the canals in Punjab has been noticed by Sujān Rāi.[49] The high quality cropping of the Punjab and Sind mentioned by contemporary sources possibly resulted from the system of canal-irrigation in these regions.[50]

Horticulture:

Bābur gives a detailed account of the various kinds of vegetables and fruits of India[51] which shows his interest in horticulture. He raised a garden named as *Hasht Bihisht* or *Nūr-Afshān*.[52] His example was followed by Akbar, who made several beautiful gardens at Āgra, Feteḥpūr Sīkrī and other places. The Mughal gardens reached their highest development under Jahāngīr, who created beautiful gardens at all the places where he stayed for some time. The most renowned examples are the Shālīmār of Srinagar and those associated with the tomb of Itimād-ud-daula at Āgra, and his own at Shāhdara near Lahore. The renowned gardens of Shahjahan include the Angūrī Bāgh of Āgra, Shālīmār Bāgh near Lāhore and the one around Tāj Maḥal.

The *Āin-i-Akbarī* very correctly points out that since the time of Bābur's arrival, a more methodical arrangement of the gardens has obtained; and travellers now a days admire the beauty of the palaces and their murmuring fountains..[53] The order and system introduced in the lay-out of the gardens,[54] the digging of little canals with running water for the gardens,[55] and the introduction of new flower and fruit trees are the significant changes of the period.

The engineering skill employed in the water-works of the Mughal gardens was of high order to which tributes were paid by visiting European travellers.[56] The practice of maintaining gardens of particular fruit-plants gained wider currency in this period. Jahāngīr encouraged it by remitting the revenue if a cultivated land was converted into an orchard.[57] It was not uncommon for nobles, officials and

the experiment did not make much headway possibly because of the difference in soil and climate. According to K.M. Ashraf,[72] 'even some time after Bābur, the cultivation of these melons was not extensive in Hindustan'.

The *Āin-i-Akbarī* mentions a similar interest on the part of Akbar: 'His Majesty looks upon fruits as one of the greatest gifts of the Creator, and pays much attention to them, The horticulturists of Iran and Turan have, therefore, settled here, and the cultivation of trees is in a flourishing state. Melons and grapes have become very plentiful and excellent, and water-melons, peaches, almonds, pistachios, pomegranates, etc., are to be found everywhere.[73] The practice of employing gardeners from Central Asia,[74] the availability of seeds from Central Asia and the special irrigation facilities helped the imperial gardens and the orchards of the nobility to succeed,[75] but their absence in the case of the orchards of the common peasants prevented the Central Asian varieties from taking firm roots in India.

Copying the Sultāns and Emperors, the chiefs vied with one another for planting different varieties of fruits in their gardens. It was considered prestigious to have in one's garden, the exotic fruits from other countries and climates.[76] In this period, a number of fruit-trees native to America were introduced by the Portuguese. Of these, papaya and cashew-nut took time to become popular (guava came to India at a later period), but pine-apple gained immediate popularity and spread to different parts of the country.[77] This fruit possibly received imperial patronage also.[78] The annual yield of pine-apple in the imperial garden at Āgra during Jahāngīr's reign is said to be many thousands.[79]

The Mediaeval period witnessed a larger and more systematic application of grafting for experimenting with newer and improved variety of plants and for cultivating plants of other geographical and climatic conditions. Grafting of plants was known in ancient India. In mediaeval times, its implementation on a large scale was due to Central Asian influence operating through the nobility. Through grafting, Muhammad Quaīl. Ashraf introduced in Kashmir cherries from Kābul. Planting of apricot in larger numbers was also due to grafting.[80] In the beginning, the grafting method was used only in imperial gardens. Shāhjahān removed this restriction. This liberal attitude resulted in a great improvement in the quality of fruits, such as 'the *oranges*, the *sangtara*, *kola* and *narangi*.[81] The *Nuskha dar Fann-i Falāhat* refers to the application of the technique to mangoes,[82] and to the grafting of fig on mulberry, apple on pear, peach on plum, apricot on almond, and vine on apple. But even the liberal order of Shāhjahān did not help the popular use of grafting. According to Bernier,[83] even in Kashmir, where it was first practised under Central Asian influence, grafting could not take firm roots. 'It was either not being followed at all or followed only very carelessly.[84]

Notes and References

See our *Aspects of History of Agriculture in Ancient India* : Bose D. M, Sen, S. N. and Subbarayappa, B. V. : *A Concise History of Science in India*, ch. on Agriculture; *Agriculture in Ancient India* (I. C. A. R. Publication).

Amir Khusrau (referred to by Ashraf K. M., *Life and Conditions of the People of Hindustan*, p. 87, f. n. 2) praises the skill and ingenuity of Indian peasants in general terms.

3. Husain Y. : *Glimpses of Medieval Indian Culture*, p. 122.
4. Ashraf K. M. : *op. cit*, p. 87. Tara Chand : *History of the Freedom Movement in India*, vol. I, p. 121.
5. Lal K. S. *Studies in Medieval Indian History*, pp-190-196; Irfan Habib : *Agrarian System of Mughal India*, pp. 249, 121.
6. Lal K. S. : *History of the Khaljis*, pp. 290-291.
7. Lal K. S. : *Studies in Medieval Indian History*, pp. 194-195.
8. Ashraf K. M. : *op. cit.*, pp. 86-87; *Ain-i-Akbari*, (Tr. Blochmann), I, p. 15, Akbar directed his Subedars to be energetic in making reservoirs, wells, water courses, gardens, serais and other pious foundations. Jahangir ordered that 'the officials of the Crown lands and the Jagirdars should not forcibly take the ryot's lands and cultivate them on their account. See Husain Y. : *op. cit.*, p. 127, Rai Bharmah in his *Lubbu-t Tawarikh*, refers to the attention paid to the peasants and Khalsa land. He says that agriculture was encouraged. He who increased the income by efficient cultivation was rewarded while he who decreased it was punished.
9. (Beveridge), I, p. 208.
10. Habib Irfan : *op. cit.*, p. 16.

10a. Yadav B. N. S. in *Central Asia in the Kushan Period*, Vol. II, p. 128.

11. *op. cit.*, p. 22.
12. *op. cit.*, p. 22.
13. Habib Irfan : *op. cit.*, pp. 36-38. The *Mir'at-i Ahmadi* (mid-18th century) claims an improvement in the quality of the rice raised in Gujarat. Rice became the chief crop of the Indus delta on account of the irrigational benefits of the rivers. The Lahore province produced a high grade rice.
14. Fryer, John : *A New Account of East Indian Company and Persia being Nine Years' Travels*, 1672-81 (Ed. W. Crooke) : vol. II, p. 108 describes threshing by yoked oxen in the 'open fields' as the practice of Muslims (Poor-man) and with stick as that of Hindus (Gentues). Irfan Habib : op. cit, p. 57, f. n. 2 attributes the variation not to the faith of the peasant but to the kind of grain and the locality.
15. Chowdhury K. A., in Bose, Sen and Subbarayappa, *op. cit.*, p. 400.
16. Habib, Irfan *op. cit*, p. 39.
17. *Muntakhab-al Lubab* (Ed. K. D. Ahman and Haig). (Bibliotheca Indica), I, pp. 156, 735n.
18. See Habib Irfan : *op. cit.*, p. 39, f. n. 35.
19. Habib Irfan : *op. cit-*, pp. 42-43.
20. Chowdhury K. A. : *op. cit.*, p. 395. For the adverse effect of the disappearance of indigo cultivation in the subsequent period see Irfan Habib *op. cit.*, p. 44, f. n. 62.

21. Our paper on 'Islamic Influence on Indian medicinal system' presented at the seminar on Islam and Indian Culture held at New Delhi.
22. Habib, Irfan : *op. cit.*, p. 45, f. n. 67 (Aurangzeb's order addressed to the diwan of Gujarat is dated in May 1659). Chopra P. N. *Some Aspects of Society and Culture during the Mughal Age*. p. 50—its use by Mughal emperors.
23. Habib, Irfan : *op. cit.*, pp. 45-46. Tea was unknown and coffee was introduced as a valuable gift in the later years of Aurangazeb.
24. *Ain-i Akbari*, (Ed. Blochmann) I, 63-64, 72-73.
25. *Mirat-i Ahmadi*, (Ed. Nawab Ali) I, p. 261.
26. Habib, Irfan : *op. cit.*, p. 48.
27. See our *Aspects of History of Agriculture in Ancient India*, pp. 90-113.
28. Habib, Irfan : *op. cit.*, pp. 55-56. For *contra* see Moreland, *India at the Death of Akbar*, p. 107.
29. *Bābur-nāma* (Beveridge), II, pp. 487-88.
30. *op. cit.* p. 27.
31. *Khulasatu-t Tawarikh*, (Ed. Zafar Hasan), p. 11. See Irfan Habib; *loc. cit.*, p. 27, f. n. 19.
32. Danī A. H. in *Central Asia in the Kushan Period*, vol. I, p. 103.
33. *Bābūr-nāma* (Memoirs of Babur), Tr. A. S. Beveridge, Vol. II, pp. 486-87.
34. Habib, Irfan : Presidential Address, Medieval Indian Section, *Proceedings of the Indian History Congress*, XXXI session, pp. 152-53, holds that it was invented by the Arbas and was introduced in India in the 13th and 14th centuries. For evidence showing the prevalence of a device resembling the Persian wheel from the fourth century or a little earlier see Gopal L. : *Aspects of History of Agriculture in Ancient India*, pp. 114-68.
35. In the reign of Shahjahan there was a proposal to give forty to fifty thousand rupees to cultivators for erecting dams in Khandesh and parts of Berar. See Irfan Habib : *op. cit.*, p. 28, (referring to *Adab-i' Alamgiri* and *Ruqat-i Alamgir*.)
36. Afif's *Tarikh-i Firozshahi*, p. 127; Thomas : *The Chronicles of the Pathan Kings of Delhi*, pp. 273-74, 294.
37. Habib, Irfan : *op. cit*, pp. 31-32, f. n. 42.
38. Habib, Irfan : *op. cit*, doubts the correctnese of the tradition associating the old channel of the Eastern Jamuna Canal with Shahjahan's reign.
39. Habib, Irfan : *op. cit.*, p. 32.
40. *ibid*, pp. 33-34.
41. Ali Mardan Khan dug a canal from the Tavi to Sodhra near Wazirabad in the upper Rechna Doab and Darya Khan, a minister of the game, excavated the Khan-wah in the Sind Delta. See Irfan Habib, op. cit., pp. 34-35.
42. Habib, Irfan : *op. cit.*, p. 31, f. n. 41.
43. Habib, Irfan : *op. cit.*, p. 35. For certain reasons these proposals could not be imple-
44. *Nigarnama-i Munshi*, referred to by Irfan Habib, op. cit, p. 34.
45. Habib, Irfan : *op. cit.*, p. 32, 35. f. n. 60.

46. See Sujan Rai, *op.cit.*, 74 for a small canal to irrigate 'Ali Mardan Khan'a garden at Sodhra (near Wazirabad) in the upper Rechna Doab.

47. Habib, Irfan : *op. cit.*, p. 32, f. n. 42 : Shihabu-ddin Khan repaired the canal of Firuz Shah to extend cultivation.

48. *Tarikh-i Firuz Shahi* of Ziya-ud-din Barani (Ed. Sayyid Ahmad), 568.

49. *op. cit.*, 36-37, 77.

50. Habib, Irfan : *op. cit.*, pp. 35-36.

51. *Bābūr-nāma* (Beveridge), II, pp. 488-517.

52. *ibid*, II, p. 531 Babur's remarks about Indians having not seen beautiful gardens (ibid, p. 532) is in discordance with the fact 'that Humayun apprecaited the layout of gardens and buildings of Bengal to make him overstay there'—K. A. Chowdhury *op. cit.*, p. 399.

53. (Tr. Blochmann), I, p. 93.

54. The lay-out of Mughal gardens is 'rigldly conventional and axially symmetrical'. It is geometrical in shape and consists of 'a regular arrangement of squares, often subdivided into smaller squares to form the favourite figure of the *char bagh* or "fourfold path"——Percy Brown : *Indian Architecture* (Islamic period), p. 110.

55. A Mughal garden is formed by means of a series of rectangular terraces arranged in descending levels with the object of maintaining a continuous flow of water throughout the entire system, as fountains, pools, basins, cascades, and similar devices are so distributed among the parterres as to make the whole into a very effective type of water-garden—Percy Brown : *loc. cit.* See Villiers Stuart C. M. : *Gardens of the Great Mughals*, pp. 14-15.

56. For Thomas Roe's observation see *Letters received by the East India Company from its servants in the East*, 1602-17, Vol. VI (Ed. Foster), p. xxvi.

57. *Jahangīr-nāma*, (Ed. Saiyid Ahmad), 251-52.

58. Ali Muhamad Khan : *Mirat-i Ahmadi* (Ed. Nawat Ali) I, p. 261—The imperial farman in the eighth year of Aurangzeb's reign; W. Foster : (Ed), *Early Travels in India* (Finah), p. 158. Earlier Firuz Shah received a considerable part of his income from his fruit gardens.

59. Habib, Irfan : *op. cit.*, p. 49.

60. Ashraf, K. M. : *op. cit*, p. 90.

61. (Tr. Blochmann H.), I, p. 93. The botanical equivalents are difficult to determine in all the cases.

62. *Memoirs of Bābūr*, (Ir. Leyden and Erakina), p. 333. Beveridge's translation (p. 518) does not reflect Babur's reactions fully.

63. Ibn Baṭṭutā says that, 'the fruits of Khurasan which are much sought after in India' are often conveyed by means of the postal service—Elliot and Dowson : *History of India as Told by its own historians*, III, p. 5888. K. S. Lal, *op. cit*, p. 227, f. n. 2.

64. (Tr. Blochmann H.), Vol. I, pp. 68-71.

65. Ashraf, K. M. : *op. cit.*, p. 89, Firuz Shah laid out 1200 gardens in the neighbourhood of Delhi, 80 on the Salora embankment and 44 in Chitor.

66. (Ed. Wilayat Husain) : (B. I), 295-96.

67. Ashraf, K. M. : *op. cit.*, p. 89 referring to *Tarikh-i-Daudi* of Abdullah.

68. Vol. I, p. 72.

69. Mu'tamad Khan, *Iqbalnama-i Jahangiri*, III, p. 557.

69a. Habib, Irfan : *op. cit.*, p. 49, f. n. 94.

70. Chowdhury suggests that the development of different varieties occurred after the Muslim period—*op. cit.* p. 397.

71. *Bābūr-nāma*, (Tr. Beveridge), II, p. 686.

72. *op tic.*, p. 89. He relies on a reference to Haji Dabur being offered some melons in Delhi which were not indigenous. *Zafarul Walih* etc. (An Arabic history of Gujarat). Ed. E. Denison Ross (London, 1921-28), II, 770.

73. (Tr. Blochmann), p. 68. In the *dasturs* the *Ain-i Akbari* mentions both the *Wilayati* (Central Asian) and Indian melons.

74. *Bābūr-nāma*, (Tr. Beveridge), II, p. 686 and Sadig Khan : *Shahjahan-nama* referred to by Irfan Habib : *op. cit.*, p. 51, f. n. 111.

75. Habib, Irfan : *op. cit.*, p. 51.

76. Mu'tamad Khan, *Iqbalnama-i Jahangiri*, III, p. 557 about Muqarrab Khan's garden at Kirana.

77. Habib, Irfan : *op. cit.*, p. 50.

78. *Āin-i Akbarī*, (Ed. Blochmann), I, pp. 69, 76, 488, 492 mentions it prominently.

79. *Jahangīr-nāma*, (Ed. Saiyid Ahmad), p. 173.

80. *Jahangīr-nāma*, 299.

81. Habib, Irfan : *op. cit*, p. 51 referring to Sadiqkhan, *Shahjahan-nama.*

82. Habib, Irfan : *op. cit.*, p. 51.

83. (Tr. A. Constable Revised Smith V. A.); *Travels in the Moghul Empire*, p. 397.

84. Habib, Irfan : *op. cit.*, p. 51.

PICTURIAL AND DECORATIVE PAINTINGS IN CENTRAL ASIA AND INDIA BASED ON THE DATA OF MAṬLA'UL-'ULŪM WA MAJHA'UL-FŪNŪN

N. A. AVEDOVA

How diversified and wealthy is the ancient art of Indian and Central Asian masters of decorative pictorial paintings, book miniatures as well as colourful ornamental paintings on wood, *gancha* and papier-mache! A protracted historic process of creative exchange in the cultural valuable assets and a constant mutual interest of the peoples of Central Asia and India towards the artistic heritage of each other, proved conducive to the promotion and enrichment of artistic traditions of national arts and crafts. It thereby created a solid congeneric relations between the two neighbourly cultures and, at the same time, preventing the brightness of their individual national originality that is so natural for each of these two nations, from fading away into obscurity.

In this beneficial exchange of cultural valuables, a place of considerable importance was held by the manuscripts and lithographical publications. Further, the more popular literacy productions were in great demand and, as a rule, were usually reproduced or repeatedly recopied by local calligraphers and served as valuable sources of information for numerous masters of art as the means of many most useful theoretical and practical aids of erudition.

One such sources of authentic mutual exchange of lively creative experience that fixed congeneric relations of artistic traditions, happens to be an outstanding literary masterpiece of an Indian author Wādjid 'Alī which, in this particular instance, was recopied only by Uzbek calligraphers on a number of occasions.

This masterpiece of Wādjid 'Alī was written in Persian language in the middle of last century in Bengal and was entitled *Maṭla' ul-'ulūm wa majma' ul-funūn* (i.e., Rising of Sciences and Collection of Trades). This distinctive type of encyclopaedia embraces practically a comprehensive list of theoretical and practical accomplishments of that period in the Middle East and was compiled in Persian-Tajik language with an abundance of various terms in Urdu. In those days, Persian literary language was widely disseminated among the educated people of the Middle East countries and, on this part, Wādjid 'Alī managed even to introduce the grammar of Persian language into his encyclopaedia.

By way of an introductory part to his book, Wādjid 'Alī included a brief autobiographic information in which he acquainted readers with the work that was entailed with his book and reasons that led to its publication.[1] Wādjid 'Alī was

born in a small port of Hoogli in Bengal, which is situated on the left branch of the Ganges to the north of Calcutta. Nevertheless, his ancestors used to serve at the court of Timurides, thus pointing out the Central Asian origin of the author's family.

The father of Wādjid Ālī was a well educated man and served as a secretary with one of the Indian princes—the nawāb of Djikhan Khān, paying a good deal of care and attention to bringing up his son in the right and befitting manner. Wādjid Ālī enumerates countless sources of information in Persian, Arabic and Urdu languages from literature, medicine, theosophy and a host of others which he happened to read in his youthful days. From this, one can easily conclude that Wādjid Ālī received a versatile encyclopaedic training. He travelled later all over India, and was not only keenly interested in scientific accomplishments but also surveyed attentively different methods of production in various places which he visited.

Gradually, as he grew older, and his maturity ripened, his innate desire was to describe in his book everything that he had an occasion to witness and to learn. In the beginning, his prime intention was to write this book in the form of a training aid that would contain a collection of informative data from various spheres of erudition. However, in the course of his work, his purely didactic aims of compositions widened substantially and, as a result, Wādjid Ālī produced an encyclopaedia which has its own originality, and indicated the exact date of its date of its composition as "....from the 20th day of the month of *Zulkhada* year 1261 hijri (20th November 1845) when he first sat down to write this book. The first part of this work is entitled *Maṭla' ul-'ulūm* and the second *Majma' ul-funūn*. Just as the Almighty wanted to assist me in my task I, before completing this book, started to publish the same. First of all, I published (manuscripts) rough copies that had been prepared by me already and, finally, things came to such a state that I was compelled to write in the evenings and to print ready copies during the day and, as such, I had no spare time left in order to peruse my manuscripts once again and, by the grace of the Alimighty, both parts of this book were ready in the month of *Shevval* in the year 1262 hijri (September-October 1846) and published by me.[2] In about ten months, Wādjid Ālī wrote and published his voluminous book which consisted of more than 400 pages of a closely written text and, as it happened, apart from this book which was one of literary creation of Wādjid Ālī, he compiled and published a grammar of Urdu language in 1849.[3]

The first part of the book, *Maṭla'dul-ulūm* (Rising of sciences) represents a code of theoretical sciences and begins with a description of Persian alphabet, grammer and the carries on with by-words and proverbial sayings on matters associated with different magical sciences, literature, history, proficiencies in the interpretation of Quran, logics, accounting, chemistry and a number of other subjects.

On his part Wādjid Álī reckoned that science and technical knowledge had four different stages, viz, the highest, middle, lower middle and the lowest. In accordance with those, he divided the second, principally technical part of his book into four separate chapters. Now, we are far more interested in *Majma úl-funūn* (Collection of Trades) which cites a large number of practical information from different branches of engineering, trade and art of that period. The separate methods and practices of artistic trade that have been elucidated here may well be traced to the creative works of the craftsmen of Central Asia right up to the present day. They testify to the effect that there were solid and large-scale traditional relations then. Further, in this book, we find a large number of very interesting data relating to the techniques of calligraphers, painters, engravers, builders, goldsmiths, jewellers, curriers, book-binders and many others.

Well over 250 references and, at times, comprehensive articles on practically every kind of theoretical and practical spheres of erudition of his period, have been included by Wādjid Álī in his voluminous work. Here one can find information about the practice of oculists, veterinary surgeons jockeys, accountants and even about swimmers and so forth. Keeping all this in view, he was closely acquainted with quite a wide variety of trades and professions, presumably, through his personal experiences.

A.A. Semyonov was the first to include the encyclopaedia of Wādjid Álī into scientific use and he considered it to be as one of the most reliable initial sources of information for studying the artistic trades of the Middle and Near East. In drawing one's attention to the section dealing with the skill of calligraphers, A.A. Semyonov remarked on the stability of technical methods and their application as well as the terminology developed by Wādjid Álī which "were employed on a nation-wide scale even among the latest of calligraphers in Bukhārā, Samarqand, Tashkent and other towns of Central Asia."[4]

As to the popularity of Wādjid Álī's work among his contemporaries attests an Āzerbāijānī source of the 19th century author of which is Mīr Mokhsoon Nawwāb who was a painter and calligrapher, poet and musician and who, in making reference in his composition, cites recipes of some paints and inks described in encyclopaedia of Wādjid Álī.[5] Wādjid's book has not been forgotten even in our times and is frequently refered to by research workers like orientologists, architectural experts and the like engaged in analysing the artistic traditions of the past.[6]

A great deal of interest in the treatise of Wādjid Álī was evinced by D.G. Voronovskii who emphasized that, in this magnificent literary work which was written comparatively not so long ago, the author has described minutely the methods and technological processes of the Middle Ages which were existing during his period in the Middle East.[7]

The encyclopaedia of Wādjid Ālī even acquired its popularity soon after it was published and, in the following half-a-century, it has been repeatedly published anew in India, Central Asia and even in Europe.[8]

In the unique manuscripts and lithographic prints which came out during the second part of the 19th and the beginning of the present century, this work was widely disseminated throughout the Iranian speaking countries of the Middle East and was found in private collections as well. Three different editions of this book are preserved in the library of manuscripts of the Abu Raihan Biruni Institute of Orientology of the Academy of Sciences of UzSSR, Tashkent. To the second half of the 19th century belongs a list (Inv. No. 2838) which was executed by an Uzbek calligrapher on thick glossy Kokand paper in *nastáliq* script in black and red inks.[9]

Another manuscript consists of two volumes, and was re-written in 1880 in Khiva from a Lucknow publication of 1862, on mill-made Russian writing paper in clear and beutiful *nastálīq* script in black and red inks The first volume (Inv. No. 6817) contains *matla-ul-ulūm* and was recopied by Ibrāhīm, son of Muḥammad Yáqub Khwārazmī and is encased in full-leather binding with stamped tracery design imprinted on its surface.[10] The second volume (Inv. No. 6818) contains *Majmua'-ul-funūn* was recopied by Muḥammad Niyāz, son of Yáqūb and encased in binding from a semi-leather material.[11]

A lithographically printed copy (Inv. No. 5250) of Wādjid Ālī's book, which is preserved in the collections of the Institute of Orientology of the Academy of the Academy of Sciences of UzSSR, was printed in 1908 (1326H.) in Lucknow in India, which was renowned for its production of high quality paper and lithographic industry) and is the workmanship of calligraphy of Muḥammad Afdal Lakhnawī. This has been in our present work as it provides some very interesting supplements that contain the history of publication of this book as well as an eulogistic review (*takrizāt*) which includes verses dedicated to Wādjid Ālī and his composition about science and trade,[12] of the times.

It is well known that Wādjid Ālī lived and wrote his book in Bengal during the times of British colonization. Nevertheless, a major portion of artistic traditions, which are expounded in his work, could trace their roots far back into times immemorial and, one way or the other, reflect the culture of Central Asia. This can be easily perceived even from the minor chapters of *Majma ul-funūn* which were translated by us. The terminology of various dyestuffs abounds in purely local Indian names *chandras tārpīn* and so forth: then in the chapter dealing with technique of painting, we have such terms as *mistar*, *qalam*, *varqār*, *sūzani-bārīk*, *naql*, *qalam-i-surb* and so on, noted by painters of large cultural centres of the 15th-16th centuries, like Gherat, Samarqand, Tebrīz, Shīrāz, etc. where in those days, existed highly developed schools of artistry. Into the foundations of this

terminology is inculcated specifically the Persian-Tajik language which was widely used in Gherat and Samarqand at that time and even later.

Majma úl-Funūn deserves a protracted investigation, since the many traditions which have been described characteristically in this book continued their existence even till the recent times, and not a few of them are still extant even today. Thus, for instance, a method of chasing is applied on a very wide scale nowadays by the craftsmen who specialize in the engraving and ornamental painting in wood and *gancha,* embroider, ceramic moulders, minters and many other trades.

Majma úl-funūn contains indeed quite large number of valuable data on different artistic crafts. Of particular interest are those sections, which deal with painting and allied branches of practical knowledge, like the preparation of paints and dyes. Wādjid Ālī places the art of preparing multi-coloured oil paints at the head of the second chapter which deals with the middle class trades, citing in this specific section, certain recipes and methods of preparing bonding substances, as well as of pigments. A number of paints and dyes described by Wādjid Ālı consists of white, black, yellow, green of different shades, and colors of brinjal and yellowish almond.

We cite below a translation of sections with commentaries on the same.[13]

Chapter I : Trades of the highest standard: Section 19 on the techniques of pictorial and decorative painters (consists of three principles).[14]

One must know always that, the technique of painting and drawing consists of reproduction of a form, likeness and images of different animals, plants and edifices and that, anyone who possesses such art, will be accepted by great states, sultans, rulers and persons of high standing, because these persons are constantly in need of accomplished masters of (pictorial) art for reproduction of their edifices, fortresses, flower-gardens, rosariums as well as images of different animals.

According to the law of the effulgent *shariat*, the portrayal of all living beings is regarded as one of the greatest sins, but, on the other hand, reproduction of edifices and of different plants is permitted because they are not considered to be animated (more objects) (1).

Such type of art consists of several principles.

First Principle: Characteristics of qualities of painters, their tools and means :

Both, pictorial and decorative painters should invariably possess elegant hands, swiftness and clarity of eyes and feelings, penetrative abilities as well as figurative mind so that, from a touch of their brush, could appear elegant picture, of different images and wonderful prophetic (symbolic) forms (patterns) (2), a

copy of which would not be able to distinguish absolutely from the original. Perfection in techniques of pictorial painters consists in the fact that they should be capable of reproducing upon a silken page by means of their magic pen, any kind of an image just as it appears to them in reality, and the happens to be a very fine task which calls for a great deal of attention because everthying, and all members of a full-fledged human body, in men and in women alike, in course of enumeration, are similar, i.e., from their heads down to the very toes including such members like head, eyes, brows, ears, cheeks, chin, neck; breast, hands, fingers, legs and nails of each full-fledged individual of human race are equal in number, although the omnipotent power of the Almighty deemed it as absolutely essential that the outer appearance of one (being) differed from another. As such, every painter must (endeavour his utmost) be sure that, under the touch of his pen, this difference is made apparent.

The object of copying is such that its portrayal corresponds exactly to the original.

On the other hand, if a person appears to be incapacitated, i.e., if he has either lost or maimed one of his members in such an event this defect should like wise be produced on the drawing and this specific task cannot be accomplished until such time that the hand of a painter acquires the essential standard of skill, while such skill of the hands depends entirely upon the duration continuous training and rules that apply to such practices as stipulated by masters (painters) are explained here in detail.

Pen (brush), rule (transparency) and a pair of compasses are the main tools of trade of pictorial and decorative masters (3).

Second Principle: Rules of practice for painters

First of all the pictorial painters must acquire as many images as possible of different animals, plants and edifices that were painted by modern masters. After that, these pictures are pasted by means of starchy solutions upon parchment (4) which is sold in abundance in the shops of different hawkers and these pictures are pasted in such a manner that, through the parchment, one can see clearly the contours of the picture. Having done this by means of a thin needle (5), make punctures through all the outlines of the drawing and, if the image is complete, then start making dots from its head to toes. However, if only half of the image is shown, then dot it from head down to its waste and if there is only a face, then outline it from head to its neck. In such a case it is most essential that the punctured dots are smooth, staight and evenly spaced. After this, light up and keep burning a branch from tamarind tree until it turns into charcoal (6) and grind this charcoal into a fine powdery mass, sieving it through a thin piece of cloth and tie a small quantity of it into a bit of fine-textured fabric, placing it subseqently beneath the punctured outlines on a (sheet) of clean thin paper, placing

the whole lot on top of a clean drawing board and, along the punctured parchment, move the small bundle with charcoal (slightly patting it) on all the outlines of the drawing (7). In the course of this process, finely powdered charcoal seeps through the needle punctures on top of a sheet of clean paper and an exact copy of the drawn contours appear on the paper. Having accomplished this procedure, carefully lift the (punctured) drawing and outline all the (details) of a copy thus obtained by means of lead pencil (8) so that the picture becomes fully visible and distinct. When once all the details of this image assume a correct form, by making use of a pen and paint, colour all the lines, dots and every piece of subtlety this reproduction in conformity with the actual resemblance of the original image so that no difference may be detected between the two (9).

In this maner, an artist practices for a number of years the art of copying the images so that his hand and brush may acquire the required degree of firmness and may be controlled by him (10) and, as a result of a protracted period of practice and assidious trainings on the pages, the (painter's) mind will glimmer the subtlety and real essence of different images and various forms and, once practical accomplishments of a painter attains such a degree of excellence, (he) may draw on a silken page any kind of picture as his heart may desire with exceptional height of exactness and naturality.

Third Principle—Description of paints

Pink Paint is prepared from the Kashgar white lead or zinc (11) and cinnabar (12), keeping always in mind that cinnabar by its proportional weight will (equal) one-fourth part of white lead or zinc. However, if to cinnabar, one adds half the quantity by weight of white lead, then the shade of paint will acquire a reddish rosy tint and will reflect more of a reddish colour.

Green paint is obtained as a result of mixing arsenic (13) with indigo (14) in such a manner that indigo will equal one sixth part of arsenic by weight. If anyone wishes to obtain a pistachio colour it's essential that (the quantity) of indigo (equals) one-fourth part (15) of arsenic by weight while some (painters) add, instead of arsenic, *piiuri* (16) or some specific type of clay which is well known in India and, which by its yellowish shade, excels the properties of arsenic.

Yellow paint is prepared only from arsenic or from (only) *piiuri*, while all the remaining types of paints are fully described in (the section of) techniques for preparing different paints.

Chapter II—Middle grade trades :

Section 23 : *On techniques used by compounders of paints.*[15]

Compounders of paints (17) cover by paints of different types, wooden and other objects (things) and by means of this type of trade, they eke out their livelihood.

In order to prepare paints of good quality, one should first ensure that the required grade of oil is prepared in advance and such an oil is made in the following manner: one part of *asar* (18) *rosin* (19) and one *asar* of linseed oil (20). First, place *rosin* in a metallic receptable over a fire so that it melts, stirring it with a wooden stick. Once *rosin* melts completely, pour into it linseed oil and keep on stirring until the viscosity (of this mass) attains the desired level, i.e., it will be neither too thick nor too thin. On completing the process, preserve (this oil) in a clean vessel.

Some masters, insted of *rosin*, admix *copal* (21), and an oil of such type will be of the highest grade (quality) because, if in the ready oil there happens to be a combination of *rosin*, at the time of applying paint (painting) it takes two to three days to become absolutely dry. Whereas, when the paint which is prepared strictly on oil to which *copal* is added, is applied, such a type of paint will dry up in the course of just three hours (22) and the drawing becomes perfectly clear and transparent. Now we shall describe in detail the cost of each (of the components). Thus, for a rupee (23) one can purchase four *asars* of *rosin* and for the same amount of money (likewise) four *asars* of linseed oil, while one *asar* of *copal* will cost three rupees.

Some of the compounders of paints mix linseed oil with turpentine (24) which is readily available in shop's of numrous dealers and one bottle of it containing three *paz* (25) more or less, costs only a rupee.

The method of preparing this (oil) is as follows: one *asar* of *copal* should be brought to boil on a fire and, once (it) is properly melted, add 0.5 *asar* of linseed oil and 0.5 *asar* of turpentine and stir (the whole mixture) with a wooden stick. Once this mixture attains the required degree of viscosity, it is taken off the fire, cooled and poured into a bottle for future uses. This kind of oil, which is of the best quality (grade) will possess very tender properties and is generally used in studies (specialized executing orders) of *emirs*. In special cases of painting, after preparing the paint of required colour, viz. red, yellow, green, black, white, or any kind of desired colour, it is mixed with the afore mentioned oil and used for the intended purposes.

Compounding of paints of (different) grades

White paint : For this preparation, take Kashgar lead or zinc white in quantities required (for work) and after grinding the same into a fine powdery form, mix with the aforementioned oil which should be kept at hand, and make use of it for purposes it is intended for. The price of lead or zinc white is never cheaper than seven or eight annas and never more expensive than eleven or twelve annas for one *asar*.

Black paint : Soot (26) collected from lamps is mixed in accordance with the requirements with the aforementioned oil and used for purposes stated before.

Yellow paint : (Take) yellow arsenic and grind it very finely either with water or sesame oil (27) until the entire mixture is fully rubbed into fine particles. Then, if arsenic is ground together with water, after drying it thoroughly in the sun, mix it with the oil mentioned before. However, if it was rubbed together with sesame oil, then preliminary drying is not necessary, but (simply) take and mix it with (described earlier) oil and use it as required One *asar* of yellow arsenic, which is essential for (the production) of paint, costs from ten to twelve annas.

Red paint : Minimum, just like yellow arsenic, is rubbed into fine paste together with water or sesame oil and mixed with (prepared in advance) oil. For one rupee, you can purchase two *asars* minium.

Green paint : This particular type of paint may be of different shades. Bluish-green colour (29) is obtained in the following manner: verdigris (30) in a dry state, after pulverizing finely, is mixed with the earlier mentioned oil and applied. Price of one *asar* of verdigris two rupees and eight annas or three rupees at the most.

Green paint with a bluish tint : Take one asar of yellow arsenic and mix it with one *chhatang* (31) of indigo and, after having ground it into a fine powder, mix with the afore mentioned oil. If one desires to obtain paint of green *masha* or of *mung* colour (32), or colour of a mellow rind, by increasing or decreasing the proportions, add a small quantity of soot or either arsenic or indigo. Price of arsenic has been mentioned here earlier. One *asar* of first grade indigo costs three rupees only.

Paint of *brinjal* tint is obtained through a composition of soot with *hurmuzī* (33) and four *asars* of *hurmuzī* may be obtained in the market for a price of one rupee only.

Paint of the yellowish almond colour is obtained from a certain species of clay which is similar in colour to that of the Moultan clay (34).

Daily income of paint-makers is no less than three annas and not more than four to five annas (35).

Commentaries

(1) Referring to shariat, the author has quite grandiloquently reminded us of the strict Islamic prohibition in respect of the rayal of different living being. Nevertheless, he readily forgets about this, when he starts to deal further with the the business side of elucidations and concrete description of exercises for accomp-

lishing skilfullness in the art of miniature painters in portraying human beings as the paramount creations of the "omnipotent power of the Almighty".

(2) In the text : (*ashkāl-e-ådjiba-i-nabawī*), literarally means wonderful prophetic forms (or drawings). In all probability, here he speaks about the canonized ornamental forms of vegetative and geometric Arab ones (*islimi, girih*) that are widely disseminated in traditional decorative art of many nations of the Middle and Near East.

(3) *Qalam*, pen or brush.

misṭar, ruler, transparency.

pargār, pair of compasses.

(4) In the text *pardeh-i bārik-i āhū* parchment, tracing paper, while in the next phrase, parchment—*pardeh-i a'iān*.

In the Rusoo-Persian dictionary by Galunov, R.A. parchment is given as *kaghaz-i-pūsti* and *kāghaz-i parshmīna*.[16]

(5) *Sūzan-i bārik*—fine needle.

(6) *Tamar-i Hindi* tamarind (Tamarindus indica), a tropical evergreen tree from a family of papilio-naceous with yellow flowers.

(7) *Priporokh*—an ancient method of transferring of picture that is alo used in our times in works of national masters of Central Asia in ornamental carving and painting on wood, *ganch*, ceramics, embroidery, etching and so on, while in Uzbekistan this method is referred to as *ahta and oolqi.*

(8) *Qalam-i-surb*, lead pencil.

(9) Technique of miniature painting is one of the most intricate process of time consuming work of any artist where, at certain instances, are hidden most unique devices that are known to either one master or another. The secret of enchantment of the mediaeval oriental miniature has attracted the attention of numerous research workers who have, in one way or another, described the technique of its creation. We have found a striking diversity of various methods of miniature paintings as well as individual styles of some outstanding masters. In spite of all this, the story of Wādjid Ålı in respect of the techniques used by miniatures painters is of great interest to us.

(10) This is a long and tedious path of apprenticeship, for an artist to practice for years in copying drawings of old masters, as mentioned by Semiyonov in his work on the paintings or manuscripts of the Navoii era.[17] Various kinds of artistic methods, which were outlined by Wādjid Ålı quite authentically reflect the pictorial traditions of preceding ages.

(11) *Safede-i Kāshghari*, white zinc.

White zinc, on being mixed with cinnabar, provide fast and stable paints, while white lead paints in specific compositions, tend to turn dark and lose its original colour. As such, we may presume that the Kāshghar whites, which were mentioned by Wādjid Ālī appear to be one of the types of zinc white.[18]

(12) *Shangarf.* cinnabar.

(13) *Zarnikh,* sulphurous arsenic.

In ancient times, both the natural sulphides (sulphurous compounds) of arsenic, viz. yellow orpiment and red realgar were used a colouring meterials in the East as well as in Europe (as found by Relman in the mural paintings in Pompeii).[19] However, for quite a long period arsenic as a colouring medium has ceased to exist since the compounds which contain it are regarded as poisonous (in our text-indigo and arsenic) and nowadays such poisonous compounds are prohibited altogether as being injurious to human health.

(14) *Nīl,* indigo—a blue paint.

(15) This part of the text is not fully discernible: since in increasing combinations of blue and yellow paints, we tend to obtain not pale-green (pistachio) colour but, on the contrary, a bright of dark green colour.

(16) *Pituri,* Urdu : yellowish chalk, yellow paint.[20] Similarly yellow paint, viz. (*purree*) which is found in Monghyr and Bengal obtained from urine of cows (which are fed especially with mango fruits) by heating, filtration and pressing.[21]

(17) *Rabqisizon,* compounders of paints.

(18) *Āsār, seer* or *syhr*—is equal to two English pounds.[22] One English commercial lb. = 453.62.

(19) *Ral,* Urdū: *rosin* In Persian language, a French term, colophone is used. Rosin is generally employed in paints and varnishes manufacturing industry, in the production of paper and in soap-making.

(20) *Roghan-i-alsī,* Urdu : linseed oil. Persian term for the same is, (*roghan-i katān*). This quick-evaporating oil from the seeds of flax, in the course of a rapid heating, emits mucous albumen substances. Linseed oil is known to be a binding agent as well as a priming substance and is employed particularly in the preparation of dessicants for oil varnishes.[23]

(21) *Chandras,* Urdū : *copal* (is of Spanish origin, derived from Aztek *kopalli*) is a fossilized ancient resin of different tropical trees found in Africa as well as in America. *Copal,* just like amber, is considered as one of the hard types of resins and is practically of the same origin as amber. In its appearance, *copal* looks just like amber and, in reality, is a transparent hard resinous substance of yellow or slightly reddish colour with conchoidal characteristics. There is a large

variety of grades of this mineral, which differ from each other according to their solubility properties. *Copal* is smelted by subjecting resinous substance to what is known as thc dry method of distillation, then dissolved in linseed oil to obtain long oil and *copal* varnishes. Amber is used likewise in the preparation of varnishes which are very expensive and durable. However, *copal* is not procured in India and used to be imported either from Africa or America, and sold at very high prices (3 rupees for 1 *asar* as mentioned by Wādjid Ālī).

(22) Three hours (*pās*).

(23) (Sanskrit) *rupee*—East-India silver or golden coin which is divided into 16 *ānnas* consisting of 12 paisa each.

(24) *Tārpīn*, Urdū : turpentine (terebinthios) and in Persian (*roughan-e Saqqiz*).

Turpentine is a resinous juice which is extracted from coniferous trees, is transparent, yellowish in colour and is rather thick in substance. As a result of distillation it, produces spirits of turpentine and resin which are used in medicine as well as in the production of varnishes and paints. Under the name of "turpentine oil" is understood the unrectified turpentine which is in the form of transparent yellowish mass, The same term "turpentine oil" is quite frequently found in the old Russian text-books on painting (as well as icon-painting), while in the days of yore, many substances of oleferous nature were termed as "oils" since they resembled oil in their appearance.

(25) Pāw, Urdū : East-Indian measure of weight and is equal to 1/4 of *asar* or approximately half English pound.

(26) Making use of soot in the preparation of paints from times immemorial was well known in Europe and in the East. The socalled "lamp soot" (obtained by means of burning different types of liquids in lamps) on par with soots of various other kinds is produced on a large scale at present and is considered as one of the most vital colourants in the graphic as well as varnishes and paint industry.

(27) *Kundjad*, *kunjute* or sesame—*Sesamu indicum*, *Sesamum orientale*) is a herbaceous plant which is cultivated in Crimea, Caucasus, Central Asia, southern parts of Europe, India and in America. Sesame oil is extracted from its seeds and has a wide scope of applications and is also used in the manufacture of paints.

(28) *Sandu*, Urdu[24] in persian (*soronj*)—minium—an oxide of lead found occasionally in lead ores. Artificially, it is produced by heating of carbonates and suphides of lead. The yellowish red powder is used as paint in the manufacture of faience glazing and so forth. Possibly, Wādjid Alī also implies *Sandarak*, under the term, Sandoor.[25] Minimum is widely employed in varnishes and paints manufacturing branch of industry.

(29) *Rang-i zangori* : bluish-green colour.

(30) *Zangor*, verdigris which is frequently used in the place of green paint (for example, in Roman mural paintings as well as in the Middle Ages during the Renaissance). It has a bluish-green colour.[26]

(31) *Chhatang*, Urdū : East-Indian measure of weight, approximately 50-55g.

(32) *Mūngi*, Urdū : dark green colour.[27]

(33) *Hoormoozī*, Urdū : a variety of red clay which is used in the preparation of paints.[28]

(34) *Gil-e Multānī*, one of the species of yellow clays which is generally rich in cloured varieties of clays.

(35) *Ānna*, Urdū : East-Indian small coin, is divided into 12 paisa.

Notes and References

1. Wajid Ali-Matla-ul-Ulūm Wa Majma-ul-funun-Naval Kishore Press, Lucknow-1323.
2. -Ditto-
3. Of this we are informed by a brief reference to Wādjid Álī in the dictionary of Beal T. W. and Keene, H. G. : *An oriental Biographical Dictionary*, London, 1894, p. 413; Wādjid Álī A. Y. *Anberry* and others: The Chester Beatty Wādjid Álī is contained likewise in *Catalogue of Arabic Manuscripts* by Arberry A. Y. and others: The Chester Beatty Library: *A Catalogue of the Persian Manuscripts and Miniatures* vol. III, Dublin, 1962, p. 307.
4. Semiyonov: *A. A. Artistic Manuscripts of Navoii epoch and its Creators in*: *Alisner Navoii.* M. L. 1946, pp. 157, 160.
5. Kaziyev, A. Y. *Artistic-cum-Technical Materials of Medieval Mannscripts*, Baku, 1956, pp. 11-12; *Artistic design of hand-written book of the XIII-XVII A.D.* M. 1977, p. 276.
6. See for example Kaziyev, A. Y. *Artistic-cum-Technical* Materials . . . . . ., p. 98; Zahidov, p. sh. *Samarkand school of Craftsmen of the XIX—beginning of the XX centuries.* Tashkent, 1965, pp. 27-28, 106.
7. Valuable consultations and precise definitions of D. G. Voronovskii have been used by the author with deep gratitude for this article.

8 and 9. In the Collection of Oriental Manuscripts of Academy of Sciences of UzSSR (vol. V, Tashkent, 1960) No. 4164, there exists an evidence concerning the English lithographic publication of the book of Wādjid Âlī.

10. Collection of Oriental Manuscripts of Academy of Sciences of UzSSR, vol. X. Tashkent, 1975, No. 6986.
11. op. cit., No. 6987.
12. Matla'-ul-Ulūm etc.
13. Translation is given as close to the original as possible. However, there are certain departures from the exact meaning and insignificant abbreviations.
14. Matla'-ul-Ulum, pp. 344-345.
15. p. 394.

16. Galoonov, *R. A. Russo-Persian Dictionary*, vol, II, M., 1937, p. 165.
17. Semiyonov, A. A.: op. cit., p. 168.
18. Here and also subsequently, certain data about the chemical composition and peculiarities of a number of dyestuffs were reported to us by Fedorovich E. F. to whom we express our deep gratitude.
19. Wagner, G. *Colourful pigments*, L., 1935, p. 240.
20. Platts, *Hindustani-English Dictionary*, Oxford, 1930. A. P.
21. Wagner, G. op. cit., p. 250 ; Laurie. *The Pigments and Medium*: *A Survey of Persian Art*: Arthur Upham Pope (Ed) vol. III, London and New York, 1939, p. 1920.
22. Platts., *op. cit.*
23. Wagner, G. Op. cit., p. 437.
24. Platts, op. cit.,
25. See also Kaziyev; A. X.: *Artistic-cum-Technical Materials* p. 115.
26. Wagner, G.: op. cit., p. 155.
27. Platts, op. cit.,
28. Kaziyev, A. Y: *Op. cit.*, p. 131.

TECHNIQUE OF INDIAN PAINTING AND ITS CONTINUITY IN CENTRAL ASIA

S. K. ANDHARE

Extensive references relating to the theory and technique of Indian painting are available in ancient and mediaeval literature. These could be divided broadly into three categories namely; (i) specialized texts pertaining to *śilpa-śāstra* and painting; such as the *Viṣṇudharmōttara*[1] and the *Abhilasitārtha Cintāmaṇi*[2]; (ii) other texts in Sanskrit, Pali, Prakrit and other languages which incidentally make use of the technical terms or words in their literary descriptions; and (iii) living tradition as preserved in the memory of artists, masons and other workers engaged in different arts and crafts who had links with the past traditions through the master and pupil tradition.

A number of scholars tried to translate and interpret the *śilpa* text in detail in the past. Among them Dr. P. K. Acharya[3] wrote a treatise on architecture and cognate subjects. It describes the aim and methods of painting in ancient India

Another noted scholar, Ganapati Sastri[4] has also rendered valuable service in this field of scholarship by editing various volumes on Sanskrit literature in general and *śilpa śāstra* in particular. The *Vāstu Vidyā Mamusyataya Candrikā*, *Mayamatam* and *Śilparatnam* are some of his contributions. But, Sivaramamurti's latest publication on the *Citrasūtra* of *Viṣṇudharmōttara Purāṇa*[5] dissolves all doubts and previous interpretations of earlier scholars who worked on it.

In dealing with textual references, one needs to differentiate between the terms, *śilpa*, *vāstu and kalā*. It is apparent that *śilpa śāstra* is used in a more general term which not only includes *vāstuśāstra*, the science of building, but also fine arts. In the *Brahmavaivarta Purāṇa* (*Brahmakāṇḍa ch. 10*), the sons of Viśvakarmā are called *śilpākarināḥ*. They are nine in number, namely *maikāra* (a garland bearer), *karmakāra* (blacksmith), *Śankhara* (a conchmaker), *kubindaka* (weaver), *kumbhakāra* (potter), *kāṃsakāra* (maker of bell-metal), *suvarṇakāra* (goldsmith), *sūtradhāra*, (a carpenter), and *citrakāra* (painter). All these professions had ethics, science and conventions of their own.

Among the surviving examples of early Indian to paintings, those of Ajanta,[6] Bāgh,[7] Sittanavāsal[8] and the one's in the temple of Bṛihadeśvara[9] in South India are noteworthy. There are also the others belonging to the later mediaeval period. These amply demonstrate that there was a noticeable painting activity in India at least from the beginning of the Christian era to the 13th century A. D.

As far as the early phase is concerned, the cannonical text of the *Viṣṇudharmōttara Purāṇa*, accepted by and large as the fourth century text (?)[10] on this subject, occupies a unique position among other texts. Being contemporary with the last phase of Ajanta paintings, the cannons laid down in the *Citrasūtra* (rules of paintings) of the above text, are followed by the Ajanta artists in much greater detail than any other source known so far. This text ellaborates the understanding of the principles of *citra* (painting) from the *citra sūtra* for which a knowledge of dance and music was also essential.

According to Sivaramamurti, the *Viṣṇudharmōttara* discusses the following:

Preparation of *bhumī* or the ground, mixing of colours in various proportions to produce variety of shades, proportion of the limbs to the main figure of the body, the principles of fore shortening and perspective, chiroscuro or shading for suggesting the effects of depth and modelling etc. But it does not contain adequate description of the painting materials used by the painters. Only once a varse describes brushes as *vartikās* each for a shade and for sketching and drawing in white, brown or black. The word *vartikā* is used in a general sense. It can mean a brush or a pencil. This is what was done traditionally by Indian painters. A sketch is first made firm with a black out-line.

The *Citrasūtra*[11] further discusses preparation of ground for painting. When the wall surface is to be prepared for painting, it is called *bhittisaṃskāra*. The board is called *phalaka* and canvas is called *paṭa*. The *bhittisaṃskāra* is described in detail giving ellaborate instructions for mixing powdered brick, gum or resin, bees wax, molasses, oil, burnt lime and plaster in different proportions. Pulp made out of *bilwa* tree leaves or bark of a tree, sand and lime to be soaked in water for a month were also prescribed. The wall surface is first treated by the application of this paste which has to be of a particular thinness. The surface is then cleaned and made glossy and smoothened with a clayey liquid, made of the juice of *sarja* (tree) and oil, and is rubbed sprinkling of milk so that when it finally dries it lasts for centuries. (The above treatment is given in brief).

The brilliance, *lāvaṇya* was always considered as a vital factor in painting, since the merits and demerits of a picture depended much on its brilliance. There is also an added emphasis on what is mentioned as *bhūlamba* or *bhūmilamba* as an essential factor for any picture. What is exactly meant by this word is not yet understood clearly by scholars. Whether it pertains to a perspectival landscape or the plumb or the perpendicularity of any *citra* is not known. Terms such as *bhāva*, (emotion), *rasa*, *yojanā*, (composition) are also frequently used.

The three-fold method of shading known as *vartana* is also discussed. Like chairscuro method of the European technique, the gradation of light to produce an effect of shading and volume on a flat surface is explained by way of *vartanas*.

The three techniques is indicated in Nanechoda's text, are as follows:—

(i) *Patraka* i.e. cross-hatching; (ii) *Binduja* i.e. dotshading; and (iii) *Raikhika*, i.e. by way of lines, which we come across when we try to describe the technique of Mughal miniature paintings[12] of the 16th to 19th century A.D., *Vartana* is known as *pardaz*. Hence *pardaz*, (*raikhika*, khātpardāz, patraka) and *dānā pardāz* (*binduja*) respectively.

In short, the *Chitrasūtra* has gone into minutest details of the technique of painting and other arts and has opened a mine of information for us.

After discussing the classicial textual sources pertaining to painting activity, its methods and techniques, we must now deal with the practical modern research of various scholars and scientists in this regard to throw more light on the paintings of the early phase. B. B. Lal of the Archaeological Survey of India, has conducted extensive research on the problems and technique of Ajanta and other murals. An extract from his paper read at the conservation seminar in 1966 is as follows[13]:

"The paintings at Ajanta are not in the true sense fresco paintings. They are really *tempera* paintings viz. paintings done on dry plaster by the application of pigments mixed with gum or glue". Thus they are executed on mud or plaster and the colours are filled in later. Gum or glue were used as adhesives as binding media, chemical analysis of the paint layer has revealed presence of gum and glue.

The rock-cut surface of Ajanta served as a carrier but its uneveness has to be adopted to serve as ground. Therefore, the ground had to be prepared first by plastering it. The plaster is composed of mud, clay plaster, gypsum or lime plaster. Except for some early paintings at Ajanta and Ellora, this plaster was made of lime and shell lime seems to have been extensively used in wall paintings of South India. As far as the pigments are concerned, we find that various pigments have been used in Ajanta such as, red, blue, green, yellow, black, white etc. as well as mixtures of these colours. It is apparent that the use of mineral pigments was prevalent because of the availability of such minerals in the vicinity of the caves. The fact remains that the trap ock at Ajanta disintegrated with the formation of various clays such as red ochre, red clay, yellow-ochre, yellow clay, glaucomite and green earth. Black colour was made from lamp soot or charcoal. For white, they either used kaoline or chalk. It seems that they have made use of certain organic dyes also such as lacdye or colours obtained from flowers. However, there is no direct evidence pointing to the use of organic colours. These minerals were ground finely and were used with gum or glue, or some similar material which were used as adhesive or binding media.

As far as the technical and stylistic affiliation between the Indian and the Central Asian mural tradition is concerned, we observe that the early mural

tradition continued in the Bamiyan Valley of Afghanistan, at Kakrak and Fundukistan near Kabul and thence to Central Asia. Apart from the unity of Buddhist subject matter, several investigators have discovered striking similarities in the technique and use of material of these wall paintings, The paintings at Bagh in Central India represent a high landmark in the classical Gupta tradition which was followed at *Pāṭaliputra*, Varanasi and Ujjaini in Madhyadeśa and the Deccan. Unfortunately, nothing is known of the state of painting in Sindh, the Punjab, Kashmir and Gandhara as the ancient examples have totally perished, and this area has not yielded any remains of paintings so far, But the survival of Indian elements in the *Bāmiyan* and Central Asian wall paintings particularly from Miran prove the existence of strong Gandhara and Kashmir schools of painting. It is likely that the painters from these areas might have sought employment of Afghanistan and even far beyond. The painted terracotta and stucco figures from the Sindh-Gandhara and Afghanistan also indirectly institute an inborn love for painting and decorative arts.

"In the absence of documents, however, it is generally presumed that the fountain-head of Indian painting is Ajanta and that its influence radiated to Afghanistan and Central Asia.[14] There is, however, a very significant reference in the *Divyāvadāna*[15] which proves that the artists of *Pāṭaliputra* and direct contact with Rohri in Sindh. It points out to Indian tradition to Afganistan through Sindh. A short story relates that Rudrāyana, the ruler of Roruka (Rohri in Sindh), often received merchants from *Pāṭaliputra* and through them, gifts were exchanged between the two Kings. Once the King of Roruka sent certain valuable armour to the King of *Pāṭaliputra*. In return, he presented to Roruka the portrait of the Buddha painted on cloth, which was received with great honour.

The influences of the so-called school of *Pāṭaliputra* are very strongly observed in the frescoes of the cave-temples of *Bāmiyan* situated in the valley of *Hindūkush* and *Kuh-i-Bābā* on the great trade route from India to China through Bactria. Here between the two colossal Buddha images on the east and west, the cliff is honeycombed with Buddhist establishments.[16] In the prosperous days of *Bāmiyan*, the facades of the caves must have been richly decorated with paintings, though combining a number of styles, were executed at the same time. The hybrid style of *Bāmiyan* is mainly borrowed from Roman Orient, Sassanian Iran and, of course, India proper. The style thus become rich, but individual influences can be determined. But this cosmopolitan style of *Bāmiyan* and other nearby sites lying on the great trade route from India to these places is due to an assimilation of multiple social elements. According to Prof. Rowland, there is strong connection between the frescoes at Ming-oi at Kyzil and the Bāmiyan, but the style has Central Asian individuality.

Indian influences at Bāmiyan, both in decoration, figure modelling and, to a limited extent, in colour schemes, is apparent. In the representation of

Bodhisattva figures, we see the synthesis of the Sussanian and Indian traditions of the Gupta period which became a recongnised means of expression in Central Asia.

The paintings of the Buddhas in the *Maṇḍala* also show the Indian influence. This represents the Indian type which evolved under the Gupta influence in Sindh and Gujarat as exemplified in the terracotta Buddhas from Mirpur Khas[17] and Devnimorī. As a matter of fact, there is such a close parallel between the plastic and graphic representation of the Buddha that they do have a common source of inspiration.

In short, if a comparison is made between the Bāmiyan frescoes with those of the Central Asian ones at Miran (c. 3rd-4th Cent. A.D.) Turfan (7th Cent. A.D.) and Khotān, they reveal the same artistic tradition to which they belonged, with predominance of Indian elements with minor differences of technique. The murals at Kyzil in East Turkestan are also related to Bāmiyan frescoe in respect of colouring and thus fall in line with the Ajanta tradition.

Investigations carried out by the Conservation Department of the Archaeological Survey of India are based on sufficient representative sampling of pigments and painted stuccos. The plaster pigment, glue and other ingredients were subjected to thorough chemical, micro-chemical and petrographic examinations which have thrown light on the close affinity between the Indian and Central Asian wall paintings, which are largely frescosecco i.e. paintings done on dry plastered surface.

Towards the end of 12th century A.D. when the mural phase comes to an end, the Jain manuscript illustrations were in vogue in western India. Wealthy Jain *śresthis* patronized lavish production of the books, such as the *Kalpasūtra* and *Kalkacārya Kathā* to gain wisdom. This resulted in a prolific production of these religious books.

It is for the first time that we see a marked Persian influence in the illustrations of the Sahi Chiefs, wearing persian costume. The wear had three components, the pointed crown, a long *jama* and boots. They are usually shown in three quarter profile.[18] The predominance of Persian influence can be observed in another important MS. of *Kalpasūtra* and *Kalakachārya Kathā* from Dev Sanopado Bhandar,[19] Ahmedabad.

This opulent ms. which dates back to c. 1475 A.D. contains Mangolian male and female types in smaller paintings, even in the border decorations. This was probably due to the influences as a result of trade contacts between Western India and Iran. This ms. warrants a detailed study. However, during the Sultanate period, several illustrated mss. both Persian and Hindu, have been discovered lately, such as *Sikandar Nāma*, *Hamza Nāma*[20] (Tubingen Library) *Laur*

Chanda of Berlin and others including the *Nicmat Nāma* of Mandu Dt. These amply prove the Persian or Central Asian influences in the 15th and 16th century paintings.

During his reign, it is well known that Akbar (A.D. 1556-1605), founded the school of Mughal painting and had patronised two masters from Persia. The reflined technique and style which have come into Mughal painting is largely due to Persian contacts which have percolated through Isaphan, Herat and other centres of painting from Persian.

Thus, it is evident that Indian painting has been the major fountain head which influenced other Buddhist wall paintings in Persia and Central Asia with very minor variations of technique, in the ancient period. The influence of Persian art and technique, on the other hand, penetrated into India from 15th centuty A D. onwards and became well established during the Mughal rule in India. In Rajastani and Paharı as well as the Deccanı schools, the Persian elements are markedly noticeable. In sofar as the technical terminology of art and sculptures is concerned as we know them today, changed slightly over the centuries and are accepted in local languages.

In the mss. of *Shāhnāma* especially, of the 18th century, Persian origin of colour, subject matter, comparison and rendering is clearly borrowed in the Deccan and the late Paharı schools.

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THE ICONOGRAPHY AND TECHNIQUE REPRESENTING AN INDIAN ART MOTIF IN THE TERRITORY OF SOVIET CENTRAL ASIA DURING THE EARLY MEDIAEVAL AGE

B. N. MUKHERJEE

One of the most remarkable archaeological sites in Soviet Central Asia is on the outskirts of the present-day town of Pendzhikent on the Zeravshan river in Tadzhikistan. It is situated about 70 km east of Samarqand.[1]

Systematic excavations of the site since 1946 had laid bare a city consisting of a citadel of the local rulers, the town proper or *shahristān*, a suburban settlement and a·cemetary[2]. According to the archaeological evidence, "Pendzhikent came into existence of as an urban settlement, surrounded by a defensive wall in the 5th or early 6th century A.D.".[3] The Arabs first conquered Pendzhikent in c. A. D. 722[4]. It, however, continued to exist until it was destroyed (or deserted) in about A.D. 760.[5] The last ruler of the small kingdom of Pendzhikent was Divashtich, documents of whose reign have been found in the archives on Mount Mug.[6]

It appears that the urban site of Pendzhikent was deserted as a result of the Arab conquests "between the twenties and the seventies of the 8th century".[7] Hence old Pendzhikent can be partly dated after the advent of Islam in Mawarannahr or Transoxiana (in Soviet Central Asia[8]) and can be considered to have partly belonged to the early mediaeval period, the most important characteristic of which was the establishment of political dominance by Islamic forces. Therefore the objects of art, found at Pendzhikent and dated to c. 7th—8th century A. D., may be conveniaently called early mediaeval. Some of them have indeed been described by A. Belenitsky as specimens of "early mediaeval art".[9]

One of these objects is a part of a wall painting found in "the main hall in the central portion of the south wall" of temple no. 2 at Pendzhikent.[10] (Fig. 1) It displays a female figure, in a half-sitting (and half-standing) posture. She wears a bejewelled waist-belt and various types of ornament. She has two left hands; the right hands are now effaced. Obviously she was originally depicted as a four-armed female. Her face is slightly obliterated. One of the left hands of the figure presses down a standing animal, recognisable as a bull (or cow) or buffallo. Its mouth is partly covered by the garment of the female figure, which is woven with square patterns and other embellishments. The front legs of the animal are placed on the body of a demon-like figure lying on the ground. The latter has the body of an animal with clawed feet and grotesque half-human and half-animal face. Either the buffalo or bull or rather the demon is being pierced by the spear

(or trident) held by the second left hand of the female figure. On a part of the garment covering the lower side of the female one may notice traces of the figure of a lion walking to its right. It is painted in white colour. All the figures are shown as set on an oval platform or pedestal, and against a stela, a part of the outline of which is seen on the left of the female figure.

The female figure has been recognised by Soviet scholars as a four-armed goddess.[11] But she has not yet been properly identified.

A clue to the identification of the female deity is supplied by the *Śiva-liṅga* (or the phallic representation of the Brahmanical god Śiva) in the foreground of the picture. The *liṅga*, depicted in black colour and set on the above noted pedestal, is adorned with a garland placed along the higher side of the shaft (Fig. 1).

The presence of the phallic representation of the Brahmanical god Śiva in front of a female deity in a killing posture should at once identify her as his consort Durgā, represented in her form as the slayer of Mahisha Demon (Mahiṣāsuramardinī), Spear (Śakti) and also trident (triśūla), either of which is held by the figure under discussion, are recognised in Indian iconographic texts as her weapons.[12]

Mahiṣāsuramardinī is one of the most well-known forms of the great Brahmanical mother goddess Durgā. Even now she is worshipped with pomp and pleasure in autumn in different parts of India, particularly in its eastern region. The autumnal worship of the goddess in company of a few other deities, looked upon as her family members, marks in popular belief the annual visit to her paternal home by Umā (a name of Durgā). But the real and age-old idea behind the worship of this Śakti (the active power of Śiva) seems to be the purging of evil (embodied by the demon) by a superior good and divine force (personified by the goddess) and the ensuring of the regeneration of the earth and fertility (as indicated by a portion of the green trunk of a banana tree with leaves placed by the side of the icons of Durgā and other members of her family during the period of worship).[13]

The representation of the ten-armed Chandi (i. e. Durga) or Mahiṣāsuramardinī (destroyer of the buffalo demon) along with her family members (deities) is mentioned in *inter alia* the *Kavikaṅkana-Chaṇḍī* of Mukundarāma Chakravartī (16th century A. D).[14] We do not get such type of representation of *Mahiṣāsuramardinī* in art before the late medieval age. In her *Mahiṣāsuramardinī* form the goddess was generally worshipped alone in earlier times. In the early and early mediaeval periods Mahiṣāsuramardinī is shown (with a very few early exceptions) as standing by the side of or riding on a lion and killing a buffalo (representing the buffalo demon) or a buffalo-headed male or a male coming out a decapitaled buffalo[15] (Figs. 2-6). Chronologically the first appearances of the different forms of buffalo demon can be placed in the order mentioned here. The number of hands of the

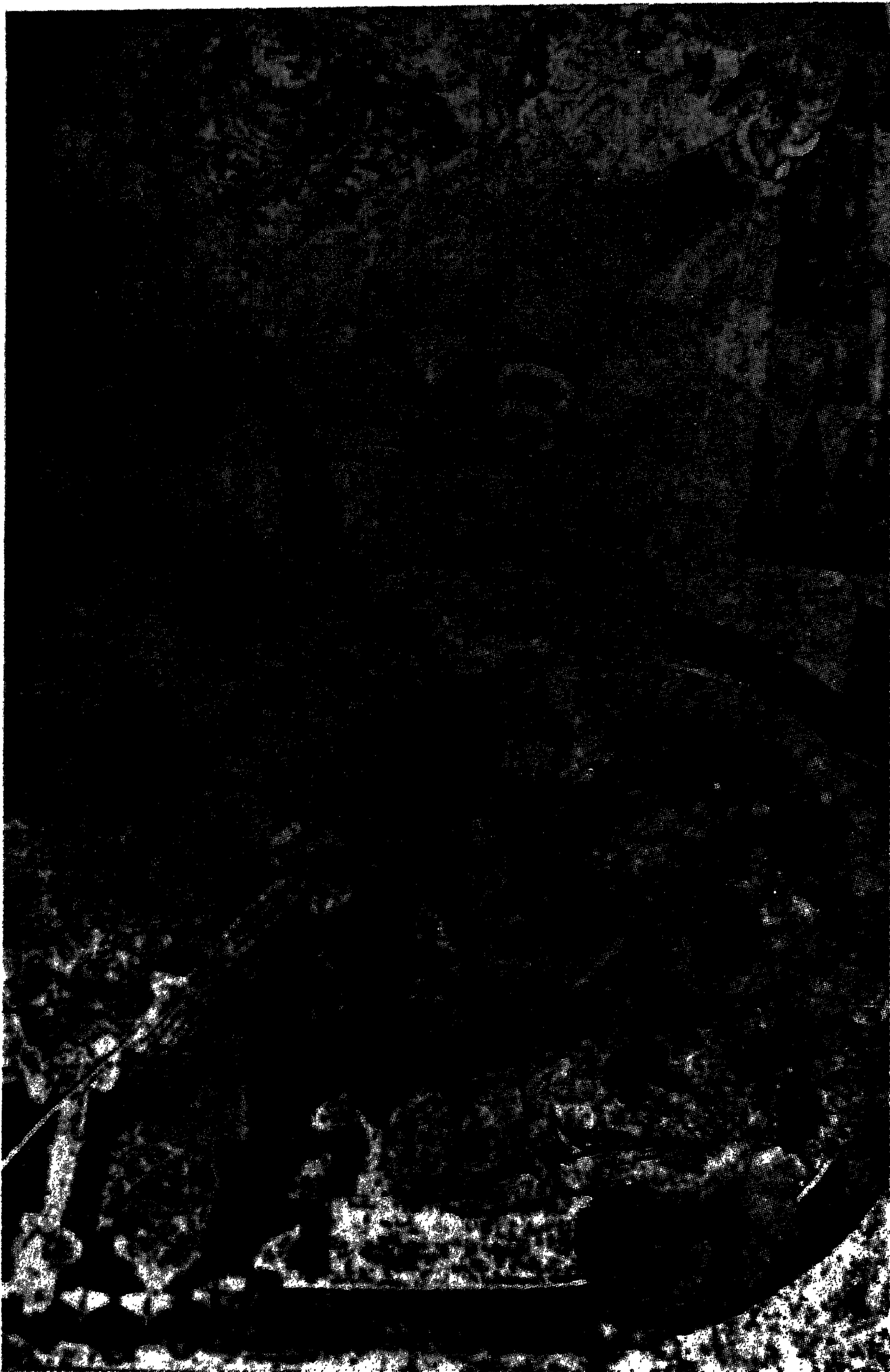


Fig. 1. The four-armed goddess in a painting at Pendzhikent

deity varies from two to twentyeight and even thirtytwo.[16] However, the earliest forms of the deity have only two or four hands[17] The story of the battle between the goddess and the buffalo demon is described in detail in the *Devīmāhātmyā* section of the *Mārkaṇḍeya Purāṇa*, while textual details of iconography appear in *inter alia* the *Viṣṇudharmottara Purāṇa*, the *Matsya Purāṇa* and the *Agni Purāṇa*.[18]



Fig. 2. An icon of Mahiṣāsuramardinī found in the Mathura area (U. P. India).

The central concept of the demon-slaying aspect of the goddess consists of (a) an idea about the lion's association with her, and (b) the legend relating to her killing a demon, symbolizing evil. The cult of *Mahiṣāsuramardinī* incorporating these concepts, came into existence in the Indian subcontinent in c. 1st century



Fig. 3. An icon of Mahiṣāsuramardinī found in the Mathura region (U. P., India)

B. C.—1st century A. D. and in a period which saw India's fruitful contact with West Asia.[19]

The impact of these contacts can be discerned in the development of the cult concerned. For her lion mount, the goddess Nanā[20] though other mother goddess of antiquity like the Sumerian Ninlil (*Ninhursag*), the phrygian and Lydian Cybele, the Assyrian Ishtar, the Greek Rhea and Athena and the Persian Anāhita also had



Fig. 4. A representation of Mahiṣāsuramardinī at Udayagiri (M. P., India)

the same animal as their mount or at least as an associate.[21] Athena, the Greek war goddess and protectress of good from evil, participated according to a Hellenic tradition, in the war between gods and giants.[22] In a scene from this episode, sculpted on an altar at Pargamon (now in Turkey), datable to the 2nd century B. C., she is shown as inflicting a giant with a spear, while her mount, the lion, is attacking the latter or another giant.[23] To another mother goddess, the Parsian Anāhita, has been traced a ritual called Taurobolium or Sacrifice of a bull, embodying the evil force, the destruction of which ensures regeneration and fertility.[24] The ritual became connected also with the popular god Mithra, who had some association with Anāhita and Cybele.[25]



Fig. 5. A panel of sculpture at Mahabalipuram (Tamilnadu, India) showing Durgā as combatting with the Buffalo-demon.

The employment of lion as a mount, the belief in her participation in a gigantomachy and the killing of an animal symbolizing the evil (demonic) force, noticeable (fully or partly) in the cults of the above noted mother goddesses, also formed the main conceptual and iconographic elements in the cult of Mahiṣāsuramardinī. No doubt, some innovations were discernible in the cult of Mahiṣāsuramardinī, which evolved centring Durgā (Umā), the Indian mother goddess. The evil demon and demonic animal symbolizing the evil were understandably identified with each other (at least in the initial stage of the development of the Indian cult) and the bull had been replaced by a buffalo, as the former animal had already been considered sacred to Siva, the consort of Durgā, the great slayer of the demon. She was also shown in the representations of her Mahiṣāsuramardini forms as pressing or crushing the buffalo demon, an action which justified the name *Mahiṣāsuramardini* (literally meaning presser or crusher, or destroyer, etc., of the buffalo demon). From about the late Kushāna age the artists concerned began, at first sporadically, to show her as using a trident for killing the animal.[26] These innovations, however, cannot minimize the value of the hypothesis about the indebtedness of the broad concept and iconic traits of the Indian cult concerned to



Fig. 6. An image of Chaṇḍi found at Sakta near Dacca (earlier in India and now in Bangladesh

the mother goddessess noted above. The cult came into being in the Scytho-Parthian and Kushāna age (c. 1st century B. C.—1st century A. D.). The Mathura area might have been one of the territories where it became popular in the initial stage of its development[27].

Nanā, one of the above noted contributor deities, was popular in Trans-oxiana from an early period, as known from numismatic and other archaeological

data[28]. Anāhita, another contributory goddess, was also known in that region from an age much earlier than the early medieval period[29]. In fact, four-armed Nanā rides on a lion in a panel of wood-carving (of 7th—8th century A.D.) found at Pendzhikent[30], (Fig. 7.). In a painting on a wall of room 41 of Sector VI at Pendshikent Nanā appears from cloud watching the action of a hero riding a horse (and protecting him?).[31] Nanā was perhaps looked upon as the patron goddess of the area concerned.[32]



Fig. 7. A wood-carving, found at Pendzhikent (Tadzhikistan, USSR), displaying the figure of Nanā on lion.

Under the circumstances, it would not have been unnatural for the people of Pendzhikent to accept a deity earlier identified with Nanā. The unification of the latter with the consort of Śiva took place in the Indian subcontinent in c. 1st century B.C.[33] In a later age at Pendzhikent the consort of Śiva could have been looked upon as an associate or a manifestation of Nanā.

In the painting under review a garland adorns the Sivalinga, as if it was offered to the later by a devotee. The figures of the goddess and others are placed on a pedestal and against the background of a stela. Such a diposition of the figures gives the impression that the artist concerned wanted to draw a cult icon. But while drawing it he made an innovation or a modification. He depicted the deity as killing a demon, whose form corresponded to the local concept of a demon

(or a dragon). Again, the artist showed the goddess as also pressing an animal (buffalo); and thereby the combined two iconic types of the goddess into one. The deity appears in a painting on a wall of a temple. All those indicate the knowledge of, reverence for and lively interest in and perhaps local adaptation of the cult of Mahiṣāsuramrdinī among the people of Pendzhikent.[33a]

This inference need not cause surprise. A dancing male figure at Pendzhikent wearing a tigers's skin.and having a halo behind his head can be recongnised as Dancing Śiva (Naṭarāja).[34] A wooden panel from the same locality, displaying a solar deity on a chariot drawn by two horses may remind us of Sūrya, the Indian solar god.[35] A picture found at the same site depicts a story of the *Pañcatantra* about a hare who persuaded a lion to jump into a lake and thereby freed the local animals from the latter's tyranny.[36]

The knowledge of the penetration of Indian culture into the region of Pendzhikent induces us to look into the possibility of Indian impact on the technique and style of local painting.

The artists at Penzhikent appear to have used "coloured earths and mineral colours" for painting. These seems to have been applied upon "a fine layer of alabaster over a plaster of loess". "The only exception is temple II", which displays the painting under discussion. Here "the layer of alabaster is missing".[37]

M. M. Diakanov thinks that four distinct styles are discernible in the Pendzhikent pictures.[38] According to him, the simplest and the oldest style of the locality is represented by the paintings of temple II, to which the one under discussion belongs. A beareded figure, with a halo, in room no. 10 of temple I, is the sole example of the second style. The face of this figures differes radically from other human faces in the paintings of this area. In temple I and sectors III and VI there are specimen of the third style. The paintings in room no. 6 of Sector VI represent the fourth style.

M. Bussaglio has pointed out that the bearded figure, the sole repressentative of the so-called second style, may be only an isolated imitation of a figure known from "the Christain art". Diakanov himself admits the affinity of this figure with the Christian paintings of Byzantium and Transcaucasia. Bussagli believes that "the presence of the bearded figure may rather be due to foreign imitation than to a stylistic development".[39] However the presence of the elements of early Christian art in local sacrophagi and the close resemblance of representations of architectural details in a painting (in room no. 13 of Sector VI) to Christian churches of Armenia[40], may suggest that there might have been a local development of a West Asiatic style coming in the wake of the advent of Nestorian Christianity. So Diakanov's second style may have a bearing on the locality concerned. However, his fourth style, which has a close affinity with the third style[41] and is rightly

considered by Bussagli as a variant of the latter[42], need not be considered as a separate style.

Of the three viable styles at Pendzhikent the first style is characterised by somewhat impressionistic handling of figures. There is an abstract flatness in the costumas, which gives no or little indication of the folds and the body beneath. The black outlines of the bodies are drawn confidently and in a manner sweeping enough to give them flowing contours. The figures express their emotion through movements and gestures. The colouring is soft, in which yellow, red ochre, brown and cinnamon tones predominate. Delicately shaded colours are used to render volume, which is achieved up to a point. Not much attention is devoted to perspective while depicting architectural details.[43] The figures are represented in more conventional and less expressive manner and with fewer number of poses and gestures in the third style. The representations of human figure betray the following of a canon for the purpose. The treatment of the figures are almost two-dimentional. Still many of the painted figures indicate a sense of movement and radiate grace and beauty.[44]

Diakanov assigns the third style to the second half of the 7th and to early 8th century A. D. He wants to date the first style earlier.[45] But both the styles could have existed simultaneously (at least for some time). We must remember that the second style, represented in Temple I, was probably contemporary with the third style, known from *inter alia* the same shrine.

The third style and perhaps also the second one probably have some stylistic relationship with the paintings at Bāmyian, where Sasanian (Iranian) as well as Indian elements predominate.[46] Thus we may expect to see at least indirect impact of Indian art idiom at Pendzhikent. In the flowing contours of the figures and in the technique of the use of shaded colours for imparting volume, we may indeed discern influence of Indian classical idiom.[47] The posture of the goddess in the picture concerned (with her right knee advanced) reminds us of the Indian posture called *ālidha*, used in showing a standing icon in a shooting (or fighting) pose. The garment worn by the goddess has the appearance of an Indian śādī. (*śaṭi*) decorated with square patterns with a (floral ?) motif in each square.

Thus penetration of Indian influence is traceable in the style and technique of painting and in the imagery at Pendzhikent.[48] However, of the outside elements in art Iranian were more dominent than Indian.

The popularity of the lion riding mother goddess Nanā in the art and religion of Sogdiana in Transoxiana might have attracted the demon slaying and lion riding mother goddess of India to Soviet Central Asia. The latter's presence was known at least in the initial phase of the early medieval period. Umā (Durgā) had earlier been identified with Nanā in the Indian subcontinent (see above). The

element common to the iconic represeutations of both Nanā and Durgā Mahiṣāsuramardinī was the presence of lion (which the latter actually received from the former) (see above). The lion riding female figure lingered as an art motif in Soviet Central Asia during the mediaeval period, when the cult and icon of Mahiṣāsuramardinī continued to be popular in the Indian subcontinent.

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2. *ASCA*, p. 72; *ACCA*, p. 155.
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7. *ACCA*, p. 155. See also Rahula Sankrityayana, *History of Central Asia*, New Delhi, 1964, pp. 139f.
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9. *Kultura i Iskusstvo Sredney Azii v Kushanakhu epokhu, Katalog Vistavki*, Dushanbe, 1968, pp. 57-58*t*
10. *ACCA*, fig. 133 and p. 245; *Encyclopaedia of World Art*, vol. I, New York, etc. 1959, col. 823; vol. XIII, New York, etc., 1967, col. 129. There are perhaps traces of a halo behind the head of the goddess. She has been described as one of the three haloed deities noticeable in the painting in the main hall in the central portion of the south wall of temple II (ibid., vol. XIII, cal. 129). Her representation in the painting concerned has apparently been reproduced twice in *ACCA*, once in black and white (fig. 127) and again in colour (fig. 133).
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16. *DHI*, pp. 498f; *WPNCC*, p. 108. and p. 119, n. 8; see also above n. 12.

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24. Hastings J. (editor), *op. cit*., vol. VIII, pp. 752 and 850; vol. X, p. 645.
25. *Ibid.*, vol. VIII, p. 754.
26. *NL*, pp. 18-20; H. Hartel's article in *GSI*, vol. II, p. 92.
27. *MS*, p. 208; *NL*, pp. 18-20; *Desh*, Autumn Number, 1983, p. 20.
28. *NL*, pl. IV, no. 8A; Pugachenkova G. A. and Rempel L. I., *op. cit.* p. 109; see also above n. 12.
29. *NL*, pp. 89-90; pl. XIV. no. 47; see also above n. 11.
30. *ASCA*, pl. XXV.
31. Pugachenkova G. A. and Rempel L. I., *op. cit.*, p. 129; *EWA*, vol. XIII, pl. 89.
32. Pugachenkova G. A. and Remple, L. I. *op. cit*, p. 129.
33. See above n. 20.
33a. The face of the demon has some superficial resemblance with that of *makara*, the mythical monster associated with *inter alia* Gangā. She appears in Indian art as riding it. We are not certain whether the artist concerned at Pendzhikent had any idea of this fabulous animal and wanted to introduce it in the iconography of Mahiṣāsuramardinī.
33. *ASCA*, p. 75, fig. 17.
35. *Ibid.*, pl. XXIV; *ACCA*, fig. 108.
36. *ACCA*, p. 108. For other possible Indian elements in the subject matters of painting at Pendzhikent see. Bussagli, M. *Painting of Central Asia*, Geneva, 1963, p. 47.
37. *EWA*, vol. XII, p. 129. L. Hambia appears to describe the Pendzhikent pictures as frescoes (*EWA*, vol. I, col. 823). But the evidence of flaking of colour in some of the paintings (*ACCA*, figs. 132, 133, 137 etc.) suggests that here the tempera technique was employed, at least for giving finishing touches. This technique was well-known *inter alia* India, from an earlier age.
38. See Diakonov's article in A. Iu. Iakubovskii *et al.*, *Zhivopis' drevnego Piandzhikenta*, Moscow, 1954; see also *EWA*, vol. XIII, p. 129.
39. Bussagli, M. *op. cit.*, p. 45.
40. *Ibid.*, pp. 44-45.

41. *EWA*, vol. XIII, col. 130.
42. Bussagli, M. *op. cit.*, p. 45.
43. *Ibid.*, pp. 45-46; *EWA*, vol. XIII, col. 129 and pl. 83; *ACCA*. fig. 127 and 133.
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45. *EWA*, vol. XIII, col. 130.
46. *EWA*, vol. VIII, New York etc., 1963, cols. Bf. "Although it is quite evident from the Russian excavations of sites in Sogdiana that with the Arab invasion in the 8th century, something like an autonomous style flourished in the feudal strongholds of Pendzhikent and Varaksha, the fact remains that the ingredients of this school of painting were the same Iranian classical and Indian elements that produced the genesis of Central Asian art of Bāmiyan" (Rowland B.; *Art in Afghanisan*, London, 1971, p. 37).
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ANCIENT INDIA AND PRE-MUSLIM CENTRAL ASIA—CONNECTIONS AND PARALLELS IN MYTHOLOGY AND ART

L. I. REMPEL

Crossroads in economy and culture have played an important part in the history of world civilization. A cris-crossing intersection of this type on the route from the Mediterranean to the Far East, and from the shores of Indian ocean into the far reaches of Eurasian steppes, that extend in a belt-like fashion from Central Europe to Pacific ocean, used to be Central Asia of the past. The tenacity of these connections in spheres of art is most remarkable.[1] Undoubtedly the mythological and poetical creations of these nations go far beyond the boundaries of the Indo-European community, since it exposes a well established parallelism in culture and are of other nations, including proto-Indian, proto-Iranian, proto-Mongolian, proto-Turkic, proto-Slavonic and so forth.

The corresponding literary attempts to reproduce antique are topics of the pre-Muslim Central Asia out of the mythology of ancient India and thereby to elucidate them turn out to be, more often than man got, just mere far-fetched ideas and are usually provoked by the very fact that they appear in the art of both these countries externally in similar forms. On closer examination, it would be seen that quite a large number of these made their parallel appearance or, in some other epoch, bore within themselves an entirely different world of ideas, experiences and feelings. Quite frequently, the images of proto-Indian, Vedic, Buddhist, Hinduism and other mythologies of India reached territories of Central Asia only at the time when, even in India, they were already pushed aside by general progress of mythological and poetic creative works. The images of indigenous mythology of Central Asian origin likewise gained their popularity only at those times when, in certain strata of society, a specific craving occurred for a need "to glance backwards".

However, it would be quite interesting to review as to which images of different mythologies, that were created on the soil of India, found their way into works of art among different nations of Central Asia and what kind of reconsideration they gained on indigenous grounds, after merging with the mythological creations of peoples of these as well as adjoining territories and, *vice-versa*. Again, what type of images which, while being associated with the Saxo-Skifian world, Central Asia and Iran, entered as a composed item into the mythological and poetic conscience of India and its various spheres of art.

The proto-Indian mythology makes it possible for us to ascertain most of the ancient connections between Central Asia and India which were prompted by direct contacts on the basis of national economy as well as concepts of the early

days about the universe. In proto-Indian mythology and culture of primordial agriculturists of Pakistan, Afghanistan and Southern regions of Central Asia, some of the Soviet archaeologists have established a doubtless proximity of ideas and forms (ceramics, terra-cotta, seals and plaques).[8] Judged by proto-urban and early-urban culture of the Indus valley civilization, we notice that in proto-Indian mythology a very essential role was attributed to different symbols that were directly associated with the age-old cult of fertility and the image of the great Mother Goddess—a cult which has continued right up to the present times. Along with all the other appertunances of nature, the bull and cow are included in the main arsenal of images of proto-Indian mythology, while, on the seals of Harappa, bulls are replaced by other kinds of animals and, together with the image of mother, they form a symbol of "Sovereign of beasts". Even at this particular stage, here is instilled a prototype of the subsequent evolution of the image of Śiva-Paśupati, the sovereign of beasts and husband of the horned goddess who, at a much later period, played a leading role in a number of religious practices in ancient India. It is quite clear, that, in Central Asia, these very same symbolic images made their appearance in a manner similar to that of proto-Indian mythology.

Motives like those of a goddess, tree of universe and sovereign of beasts, have appeared in Central Asia on a number of occasions and their portrayal on ceramics and silver of the early mediaeval period are found quite frequently. However, there is no necessity whatsoever to withdraw them altogether out of the proto-Indian mythology as it is not excluded that they possessed a common source of origin and that, from this source, various modifications took place which are noted particularly in different spheres of art.

Religious and philosophical conception of the *Ṛgveda*, having originated in the second millenium B. C., had basic principles of certain significance for north-western part of India and its nearest neighbours right up to the middle of the first century B. C. However, even much later, the mythological traditions of the *Ṛgveda* and the associated "revelations" which had incorporated themselves into the structure of later systems like the Buddhism and Hinduism, have exerted a substantial amount of influence upon all spheres of ancient art. The reason was that the authority of the *Vedas* was so prominent as the original source of numerous mythological themes, that even the Avestian tradition accepted many Vedic symbols, concepts and linguistic forms. Out of this has evolved a temptation to observe any kind of manifestations of ancient traditions not only in Buddhism, Hinduism and other trends in the mythology of India, but also the old Iranian or Avetian myths and ideas, as being of Indian and even proto-Indian outcome. Such a kind of temptation repeatedly manifests itself even in the examination of art creations of Bacterian era, Sogdia and Ḵẖāwārazm of the ancient period and even of the early Middle Ages. Thus, a scene from a wedding ceremony displayed on

Sogdian silver bowl of the 5th-6th century A. D. (Hermitage) is interpreted as an illustration in texts belonging to the *Ṛgveda*, which took shape some two or three thousand years earlier.[3] It may however, be noted that the artistic language of the oldest hymns of India and an entertainment scene with participation of Greek gods and local rulers on the bowl which is preserved at the Hermitage belongs to entirely different epochs.

As far back as in the Vedic mythology, a co-ordination was explicity expressed between the cosmogoenic diagrams of our universe, i. e. trinomial (the Earth; Sky, and Air) or multinomial (Fire, the Earth, Air, Sun, Moon, Stars and so forth) and the composition of the pantheon of gods. Later, they tried to meet certain social structural requirements of the community, viz. Varuṇa and Mitra (priests), Indra and Maruti (warriors) and Aśvin—bestower of welfare. The highest among gods (Brahmā, Viṣṇu and Śiva) are reincarnated at one time of other either into cosmogonic images or into moral and ethical symbols and concepts. Through personifications, they acquire features of humanised gods without losing at the same time any contacts with the phenomena of nature. So are Sūrya, Savitar, Agni, Mitra, Pusan, Uṣas and others. Such a structure (they appear as highest or lowest in standing among gods) allowes Vedic gods to 'infiltrate, into other cultures as well, where they continue to exist in different forms and names. As an example of such "survival" of the old motive, one can cite a Vedic concept of teaching four stages of our life. Later on, in the ethical are of Central Asia, these "stages of life" are interpreted as a theme of the rapid succession of events in the fate of a regal hero who, in his younger days reveals in hunting and merry-making and on reaching his maturity, (wisdom of ruler and in his period of senility) he grows weak and is surrounded by physicians and, finally he terminates his life-long path on a burial litter (painting on a cermic vase from Merv : 5th century A. D.).[4]

Cosmogonical model of the universe is presented in Vedic mythology as a trinomical structure having, along its vertical line, (Sky, the Earth and Subterranean world) and as quadrinomial along its horizontal line (four parts of the world). Time (year and day) and space (their correlation) produce a conception of undivided unity between the religious and philosophical as well as ideological pattern. From here one can draw a deduction about the symbolic significance of a triangle (as trinomial figure of the universe) and of a square (as designations of the four cardinal points of the world) in general.

In a similar manner, symbolism of the primitive forms of architecture and planning of settlements of primordial agriculturists was interpolated.[5] One can observe exactly the same kind of symbolism in the latest creations of architecture as well as in applied arts. But we can just ponder whether the triangle, which is inscribed into a square imprinted on tympanums of Samonids mausoleum in Bukhāra (9th-10th century A. D.), is in any way associated with Vedic symbolism ?

Definitely not, since the multiple refraction of identically the same symbols does not maintain their purport. This is decided not by palaentological ground and the actual origin of a symbol in question, nor its ultimate assignment, but by proper interpretation in the contest of its actual place and time.

Vedic mythology was conducive to a philosophical principle in accordance with which demons appear as incarnation of chaos and obstmetions to creative work. It is exactly in this context where all the monstrous creatures like Vṛtra, Vala and many others, hail from and enter into a struggle with Indra, the bearer of light and guardian of welfare and fertility. Different sculptures based on mythological themes served as a sacrificial offering of a kind to gods and thus constituted a part of a ceremonial ritual. Moulded together into one with an act of creation, prayers to gods glorified their deeds and, simultaneously, did not cease to serve as a source of yet more and more new modifications in compositions based upon themes of the main myth. Through this very act, art proved conducive to the evolution of novel ideas that later on entered into mythology of other trends of Indian religious and philosophic pattern of thinking (into the Buddhism, Hinduism and other religions).

Proto-urban and early urban civilisations of India were noted for some masterpieces of fine arts (painting and rounded sculpture). After his, a certain period of total silence descened. Such was the care with the artists and agriculturists of Central Asia. However in the first century B. C. all the statuettes disappear, while in India they gain rapid stages of development. Thus, at the end of the first century, B. C. in Mathura[6] in interpolation of anthropomorphic figures an ever-increasing degree of realism, came to the fore and, in itself, it appeared to be preparing grounds for inculcation of antique polymetric materials (plastics) in the fifth-sixth centuries B. C., while subsequently, this process became seriously deteriorated with the spread of Buddhism.

From its birth in the fifth century B. C., the Buddhism registered progressive development in the north-western parts of India and spread itself further north only in the first centuries of our era. According to *Mahāyāna* which predominated there over the orthodox *Hinayāna*, one belonging to any class could be transformed into the Buddha or any of his embodiments, viz, Boddhisatva. Universality of images of Boddhisatva, in which such kind of embodiment was to materialis helped a number of Boddhisatvas to merge with their local likeness. The mythology of *Mahāyāna* provided an unrestricted access to various kinds of myths that were associated with it on a large scale.

Figurative means of reproduction played a vital part in the dissemination of Buddhism. As far back as in the first century B. C. and a little later, a persistent search was organized for the images of the Buddha and his associates, i. e., Avolokiteswar, Ksitigharbha and Maitreya as well as the Buddha. Prior to the

development of a plastically visible image, it was personified by a symbol in the form of a wheel, reliquarium and so forth. His appearance in various spheres of art in Gandhara and Mathura is closely associated not only with non-Buddhist artistic heritage but also with the active influences of the Oriental Hallenism. However, the most important aspect is, of course, the maturity of Buddhism itself, an active propagation of which among vast masses called for his contemplation posture, further, statue-like forms with other divinities and a number of idolized images of heroes figured as well.

In the image of the Buddha, one can definitely notice Greco-Roman characteristics beyond any doubt.[7] Nevertheless, these may be attributed more to iconographic pattern of his statue, than to the specific composition of the image itself. Light-faced cauntenances of Apollo stand out in sharp contrast to the self-meditative features of the Buddha. It is not without a substantiated reason, that the Buddhist *Canon* has considerably deviated from the antique prototypes and, hence the spiritual domain of the *Canon* was viewed here in an eutirely different light.[8] Still farther in the north (Sogd, Semirechye—a confluence of seven rivers), there was a general alteration in ethnic appearances, and the *Canon* dissolves with in itself the Greco-Roman ideals and gives to the statuary type of the Buddha certain new features. Thus, from the Buddha of the Gandharan type (saturated with Hellenized forms) to the Buddha in a sitting posture and in contemplation, as a travelling preacher or as having fallen into eternal alumber, to the Buddha with humanized features that are quite close to moral and ethical ideals of the broad masses (in this actually persisted the real conception of *Mahāyāna*), lies a long path. In the early mediaèval period, the Buddha was marked by mass moulding of various details from which a specific composition eventually materialized. Such a method deprived the image of Buddhas of its inherent qualities which portrayed the individuality of a master. Moreover it hid within itself a danger of becoming typyfied, even in respect of those images, which in ancient times attained a high degree of spirituality.

Along with this the style of artistic skill also changed, becoming individualized in areas that lay adjacent to north-western parts of India (Pakistan, Afghanistan, Bactria, Tokharistan) and was more on the Iranian type in Fergana and Mongolian and Semirechye. Its physical type (ethnos) was not the principal objective of personifying the Buddha among donors and worshippers but in the interests of material benefits.

Buddhism attained its dissemination through the northern districts of Bactria mainly in the easterly direction without seriously affecting neither Sogd nor Khwārazm where Mazdaism had consolidated itself and become traditional. Buddhist monuments (*vihāra and stūpa*) as well as some large and small carved images and articles relating to subjects of the cult, were found in many locations of southern and eastern parts of Central Asia.

Buddhist relics of the past were discovered throughout the territory of Bactria of the Kushan period, viz., within the present areas of the Soviet Republics of Central Asia—a Buddhist *stūpa* at dermex, monasteries and sanctuaries at Kara-tepe, Faiyaz-tepe Ayrtam, Dalverzin and Zar-tepe. While in Afghanistan a Buddhist *stūpa* was discovered in the vicinity of Balkh, Surkh-Kotal, Angur-tepe not far off from Kunduz, at Dilberdjin and Kafirkala in the Kokchi river valley.

Quite a large number of finds in the shape of Buddhist inscriptions, terra-cottas, prints of official seals and so forth were found in different districts. The impressively outstanding are the colossal statues of the Buddha at Adzhina-tepe (Tadjik SSR), Gyaoorkal at Merv (Turkmenian SSR), Ak-Beshim and Krasnore-chins (Kirghizian SSR) as well as at Kuva in Fergana valley (Uzbek SSR).[9] In Kuva, besides the Buddha and Boddhisatva, were displayed Manjusri (possibly in the Saivite form), Vajrapani, Maitreya, Śrī-Devī and her lion-headed companions Makarāvati and Siṃhavaktra as well as Śakti Tāra, Śakti Sarasvati, malicious Māra and his demon-companions.[10]

In the early years of our era, a typical picture of a Buddhist monastery is provided by Faiyaz-tepe where the remnants of aiwan wall that ran along the court-yard and, either at one time or another, was covered with murals can still be seen.[11] Here, a figure of the Buddha carved from a marble-like limestone is placed in an arched niche in a sitting posture beneath the shade of a mulberry tree with two standing monks facing him an either side.[12] Other sculptures that decorated this temple were moulded out of standardized parts which, in their ready pre-cast state, were assembled, decorated and gilted.

For the early part of mediaeval period, far more representative appear to be the sculpture and pictorial paintings of Buddhist monasteries at Kala-i Kafirnigan (fifth-sixth century A. D.) and at Adzhina-tepe (seventh century A. D.) which have preserved, right up to the present days, the typical features of cultural interrelations of much later periods. At Kala-i Kafirnigan, the *Vihāra* itself as well as the two metre high image of the Buddha in conjunction with Iranian sanctuary of fire-chartak, depicts entirely a different epoch. Here, too, predominates a figure of the Buddha in a cross legged sitting posture with bare feet in the background of a dark blue sky surrounded by a nimbus, viz. mandrole. Just one tier below him, in picturesque paintings, are shown, gift-bearers and a number of secondary figures which retain a Bactrain pattern of rounded and broad oval facial features. In the hands of one of the priestesses is a lotus flower and a burning candle (?), while the other large figure is embraced by tongues of flames.[13]

Adzhina-tepe is regarded as an exemplary monument of Buddhist architec-ture, sculpture and painting and provides an asserting example of synthesis in which both, religious and secular creations of art appear side-by-side—in canonic forms as well as deviations from canonic patterns. Here one can see donors,

monks, hermits and traditional demonical creatures as well as monsters and ornamental motifs which were copied from the arsenals of the Indo-Bactrian art treasures.[14]

Statuary portrayals of the Buddha from Adzhin-tepe and Kala-i Kafirnigan (Tadjikistan) have retained their canonized pattern which was created as early as in the Kushan period. But, they are filled with an entirely different sense, since massive forms of Indian plasticity and harmony of erect proportional body of Greek masters have backed out in the face of elegance, langour and romantic set-up. Poetics of elevated standards began to prevail over the religious ascetism and philosophic morale, while the religious and moral stimulus gave way to a common spirit of an epical beginning. The Buddha himself became an object of worship on grounds of an idolized here. Is it not from here that, in mass production of terra-cotta of Sogd along with miniature images of the Buddha depicted in canonic composition, some of the figurines made their appearance in the form of Buddha-Apollo as a graceful singing youth? However, as we have deduced at present, this portrayal is of neither the Buddha nor, for that very fact, of Apollo.

On its own part, the district of Toharistan itself represented, as was mentioned by B. A. Litvinskii, a "complete fusion of Indian and Central Asian elements."[15] While spreading gradually further to the East, this style became covered by ethnic forms and acquired that specific content which was so natural to Confucianism, Taoism, Dzen-chen and so forth where it was no longer looked upon as merely an introduced art of the missionaries, but of religions which were closely associated with ethnic historic traditions. The Buddhist art in Semirechye, does not represent a fragment of Buddism that encompassed in those days the whole of Central Asia, at least it may be regarded as a fairly good mixture of Buddhism, Hinduism and Shamanism.

In India, Hinduism incorporated into its structure a number of different cults that managed to by pass the doctrine of Buddhism. Thus, based upon the principles of national cults, it succeeded in creating a new universal religious and philosophic system, the typical theme of which was to transform myth into epos, although in the depths of mythological practices, were the heroic legends and epic mythology of the puranas. Hinduism of today, just as it used to be thousands of years ago,—wrote Herman Hesse, "appears to be a predominant religion of India which peacefully unites in itself diversity of the garden of Eden of the most inconceivable contrasts, some of the most incompatible formulations, some of the most contradictory dogmas, rituals, myths and cults that one day dare to imagine, i.e., most delicate alongside with the most coarse, highly spiritual side by side with sensual and carnal and the kindest on par with the cruelest and wild."[16]

In India, the goddess Pārvati is depicted as mounted upon a lion while in Sogda, the goddess *Nānā* (or *Anahita*) as mounted upon a marcing beast or seated

upon a lion throne (thoreutics of Central Asia, wood carvings and paintings of Pendzhikent and Kah-Kah of the sixth-seventh century A.D.[17] It was without the influence of India that the ancient Chinese goddess, Guan-In, was likewise depicted at that time as mounted upon a beast or sitting upon it, while reclining on its side.

A whole tangle of closely related themes bring much closer Central Asia with India; for instance, "mountain" goddess looking upon a battle from behind mountain peaks (Pendjikent).[18] River is personified by the image of *Anahita* just like goddess '*Gangā*'. The "Supreme goddess" shows herself in the Hindupantheon in a multiplicity of forms and is worshipped as *Guari*, brilliant *Satī*, frightfully black *Kāli* and horrible *Korala*. In each such epithet, there is a double female of Śiva. Finally the three-faced divinity in the paintings of Pendzhikent reminds us of the principle conception of Hinduism i.e., the image of Trimurthi (Brahmā, Viṣṇu and Śiva). As three-faced divinities, other gods were depicted as well and were created by mythologies of the Middle and Centre Asia.

In the mythology of India, the almighty Śiva appears with a bull, bunch of lightings, a trident and a goat. His distinctive feature is a third eye on his forehead. Usually on his head, he has a crescent, his body has a bluish tint and is surrounded by flames. He is also quite frequently shown as having four hands holding a trident, a small drum, a battle axe or a club and armed with a bow and a net. On his neck is a garland of human skulls and he wears ear-rings consisting of snakes.[19] To the multitude of male divinities of Indian origin in Kushana pantheon one can also add Skanda, Kumāra and *Bizago*—all warriors armed with either a sword or a sword and a lance.

From different local sources into the Kushan pantheon were drawn the following: Mitra, Mah, Vado, Atsho and Farro were associated with the cult of fire, while Hvaninda Ardohsho and Vakksh were associated with heavenly and terranean waters. In Indian altered version, Farro had a confluence with Panchika, while Ardohsho with Hariti. On the other hand, according to Greek version, Mitra was confluent with Hercules, and Atsho with Ares. Indian divinities, in turn, were intermixed with the Greek ones—Mitra with Hercules, Hercules with Śiva, Atsho with Ares and so forth.

Goddesses also remained in a state of a continuous mix up: Ardohsho with a horn of plenty; Pārvati as wife of Śiva; Luxmi as goddess of good fortune: Greek female divinity, Tikhe, with Iranian Ashi.

Demoniacal creatures included Makarā in whom crocodile and dragon were mated as well as Kurtimuhta. By way of attributes from the animal world, were depicted such animal as the bull, Nandi (attribute of Śiva); bird Garuḍa (attribute of Viṣṇu),; swan (of Brahmā and Saraswathi); lion (of Durgā) ram (of Agni, the

god of fire); deer (of Vāyu, the god of winds) and so forth. In Central Asia also different images received alternative sense of expression and were reshaped in the light of one's own legend and taste.

A winged elephant on a Nisian rhytone, carved from ivory, would be difficult of any explanation on the basis of Parthian Iran, if no "winged elephants" existed in the arts of India (Amaravati).[20] On the other hand, man-like bull (*Gopatsha*) in equal degree, dates back to Iranian mythology (*Gavomard*) as well as to zebu-like bull which is well known in the art of India from the times of Mohenjo-Daro and right up to the days of Sanchi stupa. Finally, a semi-human being who grows out of the grape vines and leaves (*kinnarā*), a motif which is well known in India, i.e., (Bārhut)[21] and in the finds at Tilliyatepeh (north Afghanistan).[22] Along with the Bactrian and Parthian contributions to the formation of Gāndhāra school, quite a substantial contribution was made by India itself to the arts of contigious regions,[23] specifically to that of Kushana dynasty as well as of Eastern Parthia.

Portrayals of beasts, birds and animals (among them a horse, an elephant or a hunch-backed zebu-bull) in the ancient art of Central Asia, are similar in nature to specific patterns of India, even though they were admitted into Buddhist symbolism, while in a Buddhist complex at Kara-tepe they evidently stand much closer to Eastern Achamediam tradition as well as its ancient ethnic parallels (stone capitals).[24] To the categories of authentic Indian tradition we may attribute only a portrayal of two elephants that appear on fragments of stone reliefs with an arcade, while with Buddhism and its attributes, we may associate partially the portrayals of monkey (ceramics). But even this motif went far beyond the limits of Buddhist area and was retained in Sogda at a much later period.

In harmony with the image of Śiva there happens to be an impression on ceramics unearthed at Afrasiab (Samarqand) that depicts figure of a man standing at his full height with a trident held in one hand. Direct connection of this image with Hinduism is likewise indicated by a terra-cotta slab from Daltverzin-tepeh where an armed holds in one hand a trident, while in the other a severed head of his enemy (or head of the fantastic Kuti, Ukhi) with a striped beast lying at his feet.[25]

Let's take it into view, that trident is an attribute of Avestian Apam-Napata whose role, as a guardian of waters, is just about similar to that of Neptune, while a dance, performed by Śiva, in murals of Pendzhikent (7th AD) may be attributed more likely, than not, to fairy-tale topics in accordance with which Hinduist images were accepted in Sogda of these days, than to assign same to ultimate outcome of the Sogdian mythology as such.[26] On the other hand, successess of the Śiva cult are quite understandable if one takes into account, that his predecessor in the Hinduist mythology was Rudra—the god of sun, a mention about whom is made as far back as in Ṛgveda where he was represented as "herdsman". Cult rituals were

performed, as it was stipulated in relative prescriptions, in the absence of brāhmans. It's well known fact, that in appealing to Rudra, his worshippers sought patronage over their dwellings, fields, herds and roads and, at the same time he is looked upon as "a guardian of craftsmen, cartwrights, carpenters, blacksmiths, potters, hunters and boatmen, while personally himself, he is regarded as a crafty merchant and, at the same time, he is a commander of armies, god of the valiant, infantrymen and all those who take part in a battle on chariots, as well as all those who make their living by wielding a lance, bow and sword, and his piercing yell may be heared in the thickest moments of battle and his mighty voice resounds in martial drums".[27] Evidently, Rudra-Śiva had his own doubles in Sogda as well, where on terra-cotta slabs Sogda, crowned by tongues of flame stands a warrior dressed in a lamellar coat of mail, with helmet donned on his head and decorated in the likeness of a bull's face (or it may have been a mask) and a monkey seated at his feet.[28]

Iconographic representation of Śiva and Rudra intertwines itself, however, with everything taken into account, both of them are regarded as expositions of one and the same essence, expressed in an orgyastical dance and performed by Śiva upon the corpse of asoor Apasmāra that was slaugtered by him. Śiva, by denouncing ascents, made linga, his male organ, as his principal symbol which became one of his major attributes.[29] In reality this organ reflects Śiva's orgyastican energy. Terra-cottas in the shape of phallus could be found in the ancient Samarqand quite frequently and, whether they have any association with Hinduism and its embodiments, is rather difficult to assert at present. However, in either case, parallelity is quite pronounced here, although it's as much probable, that this symbol used to exist in Sogda and, irrespective of the cult of Śiva, is regarded as one of the items of sympathetic magic.

Son of Śiva in Hindu mythology is represented as Skanda, the god of war and used to be portrayed with a spear in his hand, bow behind his back and a rooster drawn upon his banner. In Sogdian terra-cottas, in connection with this personage slabs are closely associated upon which a horse-mounted warrior is depicted standing at his full height in a coat of mail and a quiver slung behind his back. In his hands he weilds a spear crowned by a bird (possibly a rooster?).[30] In an article relating to cult of Shāhi-Zinda I discussed at length this image of "kind of youths" as being that of Sraoshi who is likewise armed with a spear, a battle club and a battle axe and who used to awaken the world by crowing of his rooster.[31] It's quite possible that, in connection with this portrayal Skanda himself may be depicted who is interpreted according to Hindu mythology as a heavenly warrior.

In the Sogdian texts a mention is made in regard to Zrvan, Adbagh, Vashparkar, Nārāyana and Vaisiavana and, on their part, A.M. Belenitskii and B.U. Marshak presume, that in all probability Sogdians used to idolize their gods on par

with the Hindu ones roughly by the following principle: Brahmā-Zrvan, Indra-Adbagh and Śiva-Mahadeva-Vashparkar and, if this is so, then in artistry of Penjikent the Sogdian god Vashparkar appears as a youth behind whose back are depicted bared teeth of some beast as well as a lynz.[32] However, at the moment this may be considered to be just another sphere of presumptions and, in exactly the same presumptive manner, we can make an assertion in respect of all terra-cotta ball which was discovered by Z. Usmanova in course of excavational operation in the ancient Merv, on front part of which eyes were plastered on, a mouth was drawn and hairs were pressed down by a comb which are arranged in a zig-zag fashion. A rounded hole on its crown and a puncture in the lower part of its head makes us believe, that before us is the head of a rag-doll. Nevertheless, it's well known fact, that toys frequently retain the images of various cults that have gone into obscurity a long time ago. and, as such, one may only presume, that this ball-shapped head, minus its hands and legs, is in reality Vaivasvat, known as a fore-father and an ancestor of our mankind. He was known as far back as in the Ṛgveda days, but later on in mythology of Hinduism he became a symbol of Sun and, just like the solar disk, he is spherical and deprived of all his body members, while his brothers (Mitra, Varuna and Bhaga) "chopped off all the extras from his body."[33] In national cults the image of Vaivasvata may have been preserved likewise away from the dogmatics of Hinduism for as long as purportedly he was the first one to make a sacrificial offering and presented people with a gift of fire.

Yet, another most interesting parallel suggests itself out of comparison of the image of Kṛṣṇa and Siyavusha where Kṛṣṇa is a guardian and defender who averts evil and his double functions has proved itself in a fact that, he happened to be a demon (colour of his body is dark-blue, verging on violetish tint), i.e., the enemy of Buddha. Nevertheless, as a guardian and an idolized hero he just like Rudra, dates back his genealogical trees down to a tribe of herdsmen and accomplishes heroic deeds in his fight against snakes, thus protecting cows and herdsmen alike.[34] Image of Kṛṣṇa could be associated with all other similar to him heroes who hail out of a cycle of Avestian legends and right upto Siyavusha, the most romantic hero of them all, whose name was mentioned as Siyavarshan in Avesta. In terra-cottas of Sogda a youth in a soft pointed cap, playing on a herdsman's reed-pipe[35] stands closely by the image of Hinduist Kṛṣṇa and remains in a certain type of relationships with the other sufferers of the Attis type, whose cult was disseminated throughout the Hellenistic world in connection with the worship of Kibella the Great mother of gods.

Mythology of Iranian-speaking peoples of Central Asia is in close continuity with Iranian mythology and, as such, has laid its imprint likewise upon the mythology of primordial Turkic speaking peoples who have played a significant part in the cultural history of Central Asia. Iranian mythology, in turn, in a number of elements dates as far back as Ṛgveda dynasty but, with all that, it never

was its copy and only a few divinities of the early Mazdeism indicate as to the actual source of its re-design. With everything taken into due consideration, as was time and again mentioned previousely, gods and demons (divs and ahoors) in Iran were accepted in exactly reversed sense of its meaning in comparison to India where gods were called as divs and demons as asoors (in Iran gods were known as ahoors, while demons as divs). It may be surmised, that kind of transportation of epithets stands to indicate the most ancient, emanating out of the depths of centuries, opposition of Iranian priests to those of India. A similar kind of opposition became quite evident in Iran at later times when, during the region of Ahmenides, religious reform was directed against the hated tribal gods, viz. divs.[36]

Centralized pattern of religion of Ahmenides established strict correlations between the divinities of a single united pantheon which was errected in accordance with the class principle and, based upon these grounds, a necessity steadily asserted itself to confirm the mythical past in perceptible forms of art. As such, legendary history of struggles between the good and the evil has merged itself with legendary history of our first sovereigns as well as our ancestors.

Struggle between good and evil was considered from various angles of standing, viz. lowest, as one that has no status of divinity whatsoever (totems and spirits) and on much more elevated standards (cosmic, anthropologic and abstractively moralizing). In view of this, each one of these was provided with its own special forms, handed over by tradition from one generation to another. Avesta of the early period and its latest editions that, by themselves, represented something of a code of rules and regulations of different periods and times. Certain persons presume, that in Central Asia Zoroastrism in its reformed state found no followers in these parts whatsoever as it was pushed aside by the far more ancient Mazdeism, prescriptins of the early Avesta and public cults of the most diversified origin.[37] Such deduction is made on the basis of monetary mintings of Kushana Period and, judging by archaeological observations conducted over different methods of burials one can easily arrive at a conclusion, that at one and the same time and in one particular spot deceased were buried in a different manner. However, is it that the essence of religion manifests itself in different rites alone? Because in each of the universal religion one can uncover various types of component parts and, as such, religion of peoples of Central Asia made no exception whatsoever, since it is diversified in a motley of innumerable cults and rites, that have rooted themselves in different ethnic environments. Still, by far the most important in unity of religious and philosophic teaching, rests in dogmatic principles which became essential material for spiritual mode of life. Art, just like imaginative way of thinking, is akin to philosophy and, as something that outlives itself, it reflects phychic contribution and nature of ethnosis and, if the art of any specific region stands on high level of common public ideals, i.e., mature in skilfulness and undivisible in

idiology, then there should be no grounds whatsoever to reject it so far as maturity in religion is concerned, just like a system of regularized dogmatic teachings and authentic conceptions.

As a matter of fact, art is incapable to embrace the highest manifestations of religious and philosophic trends of thought which surrounds its own environments and, in spite of all this, within the scope of mental reconstructions, religion of pre-Moslem Central Asia proximates to all other dualistical conceptions of old ages, i.e. struggle of good against evil in worlds, both cosmic and material, passes in a sphere of corporeal and spiritual forces, whereas piety and honesty are founded entirely upon the whole conception of the universe and upon the laws of its formation. Thus, in the Iranian-speaking world, entire history of our universe, right from evolution of matter out of chaos and the world, from world of animals to a first primordial human being, from Ahuramazda and Angro-Maniu to Jemshida and Zohaque it was called upon to establish hope on Saoshyanta ("Saviour of the World") who periodically becomes reincarnated.[38] His last arrival will conclude by condemning all sinners to eternal sufferings and torments. As basis for this particular idea partially serves the Central Asia epos as well which was developed on the grounds of all the mythology that preceded it.

Syncretism of cults and their merging in this event passed on a far wider basis than in the orthodoxal Iran, and at the time, when in the western part of Iran in the ancient times predominated cult of Ormuzd-Zevs, Helios-Mitra and Veritragna-Hercules, while in heathen Armenia cults of Aramazda, Askhik-Anaita and Vakhanga, in Central Asia Mezhdurecye (confluence of rivers) as in evident a triad of its own came to stay, viz, Ahuramazda, Anahita-Nanā and Siyavush-Mitra and each one of these preserved its ancient Iranian subfoundation and was regarded as a creation of local mythology, whereas Sogdian calendar, which was discovered on Moog mountain (Tajikistan) reflected in itself names of other gods as well which have entered together with their retinue into pantheon of selected divinities and heroes.[39]

One of the major places in the ancient Iranian mythology is held by Mitra-god of the sun, and in moral as well as in the ethical plan he is regarded as paramount guardian and judge. His role is so great in protection of pastures and lands as well as maintaining of law and order in marriage rituals that temples were dedicated in his honour in various parts of Iran, Central Asia and far beyond their boundaries. In Ṛgveda he is mentioned in association with Varuṇa by his antipode in the cosmogonical world, while in Avesta he holds practically top most position and, as protector from cold and darkness, warrior Mitra as a later period received a wide-spread dissemination in the West as well amongst the Roman legionnaires owning to whom, miteums were set-up on the outskirts of the Roman empire right up to the coast of Britain.[40] It's precisely at this time, that gods were presented throughtout the Middle East as a rule in cults that were proximate to those of

India, Iran and Mediterranean countries. During the early mediaeval period sculptural terra-cottas of Sogda cease to depict various gods and instead the idolized hero-ancestors and hero-forebearers of the ruling domain are glorified. On my own part I can just imagine, that Siyavush happened to be one of such heroes among our ancestry. who has eclipsed by his valiant deeds in Sogd and in Horezm the antiquated Helios-Apollo-Mitra.

Interstitial position between Hinduism, Mazdeism and all other religions was held in Central Asia by Manicheism and fragments of miniatures and murals of this particular period from eastern parts of Turkestan leave very little food for thought so far as anything exceptional may be mentioned in regard to "Manichian school" in artistry is concerned, although they do assert very high standards of their artists who were the followers of this sect. Zoroastr, Buddha and Jesus Christ are regarded by Manichians as successors of prophet Mani who was founder of this concept of indoctrination. On par with that, Manichian pattern of teaching presents in itself a fusion of cosmogony, eskhatology and ethics of kindness and evilness, of light and darkness, while "Buddhism,—writes B A. Litvinskii, has rendered a significant amount of influence on pantheon, terminology and even conceptions of the eastèrn Manichism (in a lesser degree upon Nestorianism as well), and likewise upon the entire pattern of religious practices. One Manichian hymn in Turkic language is addressed to "my father, Mani-Buddha".[41] From a common public belief Manichians have made an adoption of the tree of peace which stands for a symbol of the universe and is interpolated as a tree of life and death, while in cosmogonical trends of conception ethical superstructure is asserted as well that personifies all men of Virtuousness who are confronted in kingdom of evil by dark forces—vassals of Ahriman. The paramount mother of gods and the first human are interpolated not only in the visible images, but in spiritual as well. Bearers of light producing inception are materialized here in their struggle for relieving life from shackles of immovable matter and, in a row of seven highest beings of the kingdom of light, stands Mitra who is conquering the forces of darkness.

In such manner Manichian religious teachings are presented to us as a mixture of different conceptions of indoctrinations that are essentially modern to it and that are rising up towards the cosmogonical schemes that have adopted abstratedly ethical and moralizing sense. One may allow, that in various murals of Pendzhikent Manichian masters have taken a part (these murals lack homogeneity), but so far as this happened to be painting of a sectular nature, while in temples of Penkikent scenes from epos predominated principally, we have no evident reasons to regard it as being of Manichian origin. Religious types of painting drawn by Manichians so far is known to exist only at Sintzian (Eastern Turkestan). This, however, doesn't signify in the least that dogmatics of Manichians in artistry of Central Asia hasn't been reflected on the whole as, some definite connection with Manichiasm is indicated by a stone mortar from Turtkul-tepeh (Southern Kazakh-

stan)[12] which on its external sides has an equiedged cross, a dove, a wicker-work that symbolizes a tree and a snake, seven oval-shaped objects that are dressed upon a rod (seven "levels") of the state of spirit in dogmatics of Manichians) portrayed in relief. In these symbolic paintings teachings of a Hinduistic nature may have been reflected as well in respect of the six tiers of heavens, rising high up above the earth as well as seven tiers of subterranean world (*pātāla*) and the seven tiers of hell (*naraka*) beneath which lives the snake-like dragon Śeśa. The interwoven pattern, depicting a tree with snakes, might have been a reflection of a Hinduist concept about a cosmic ocean in which lives the same serpent known as Śeśa.

Distinction in aesthetics between Hinduism and Mazdeism, the two religious systems which have encountered with each other in Central Asia reposes, apart from different dogmas in faith and aesthetics of Hinduism on one part (its sensuality and ascetism just like the two polar manifestations of ethical beginnings) and of Mazdeism (with its ideals of worshipping light and its heroisation of ancestors).

In the sphere of craftsmanship the art of Central Asia was in relationship with the sculptural plasticity of India only merely due to dissemination of Buddhism in its canonized forms, while in the secular sense of art they were separated widely apart.

It's worthy of mentioning here, that Buddhism and Hinduism made use of one and the same type of art and, in essence, their figurative methods are practically identical and, after they were brought over to soil of Central Asia, they have likewise preserved their singularity and, as such, it would prove to be quite an unfounded punctiousness to seek in each individual case some distinction in either of the two religions through an expressiveness in art. However, regarding indigenous spheres of art in general, and secular in particular, it should be noted that art of India is attaining steadily a stable character and, on my part, I would call it as a missionery art as such the whole of India's art on basis of Central Asia in Baktria and Tohoristan.

In different sculptures of the ancient India chiefly predominated expressive moulding of human figures, plants and river waves in which an overwhelming passion of spontaneity catches one's imagination, fascinating and refined forms of feminine body and vitality of at times not in the least beautiful, but very touching by their spontaneity forms, For example, lavish blossoming of the southern flora which is saturated by finest of scents and nectars, somehow seems to be filling up one's mode of life and even the most of dejected moods, in which usually rakshas the demons find themselves, serves only as a background upon which the elevated images of gods appear in strikingly bright colours. Being double-faced by nature they horrify anybody by their inhuman might and attract fallen souls to their pedestal by their benevolence and beauty. However, in this case canons of iconography

are not considered to be as canons of a from as such from infinitely varies and multiplies in respect of the original image, but remains as an expression of principal idea that dissolves within itself pantheism, tantrism, demonology and magicism of primordial faiths. Such is the ancient art of India which combined in itself the deepest traditionalism with its ability to absorb within it all the artistic ideas of spiritually accustomed countries and to repay them in a hundred fold in a turbulent flow of images reformed by it to other neighbouring countries.[43]

Stylistically the art in Central Asia on various stages of history was heterogenous both by its idological trends and its composition.

In the first centuries BC, Baktria and Eastern Parthia ("Buddhist Iran", according to expression made by V.V. Bartole) were drawn towards India and Hellenism, while Kangyui was taken up by a "beastly style" of settlers of the Eurasian belt of steppes. At the same time on territory of present-day North-Western India, Pakistan, Afghanistan and Southern borders of Tajikistan, Uzbekistan and Turkmenia all these components crossed between themselves, thus producing new merged forms and new ideas deposited themselves upon the old ones, developing them still further.

In turn, eastern Hellenism produced a fusion of styles in which aesthetics of the Asian continent engulfed the entire region, viz. from India and Baktria right up to Parthia and from the shores of Indian ocean to Sogd and Horezm. Plasticity dissolves itself in the oriental ornamentation, aesthtical forms in magicism and symbolics, while harmony of froms in expression of feelings and on these very grounds rose and flourished such vivid and original creations of a mixed Greco-Parthian and Indian style like Parthian rhytons from Nisa (Turkmenian SSR) and golden articles of jewellery from Tilliya-tepeh (Afghanistan) and every one of them have reflected the process of dissolution of Hellenism within the Indo-Scythian domain: predominance of Greek pantheon and plasticity of Hellenism on rhytons of Nisa (2nd century BC), Greco-Scythian and Indo-Scythian elements in different articles from Tilliya-tepeh (1st century BC), while during the first centùries of our era an importance of local schools grew up considerably, including of the Hinduist at Mathura, Baktrian at Gandhara and Yuichzhean (Kushani in reality) at Halchayan (on threshold of our era) and at Dalverzin (1-2nd AD).

Temples of Dynastial ancestors of Kushana were closely associated likewise with cult of fire and with Mazdeist one as well (Halchayan, Surkh-Kotal) and in a place of Halchayan-tepeh used to be depicted: sitting upon a throne a sovereign together with his patron divinities among whom was a warrior maiden of the Athens type and, just close by, Hercules with satires and a number of rulers from dynasty of Kushanas which had no prototypes either in Greek, or in Indian plasticity. In the images of these rulers prevailed rather a serious expression of rigidly composed forms, while heights of a frieze they cast their glances upon a swirling

turmoil of an everyday life (Halchayan-tepeh). Portrayal plasticity with exceptional passion used to express high tension of a full-blooded life which was pushed down those who crowding about the throne and only some time later, in a sculpture from a Buddhist sanctuary at Dalverzin-tepeh, enlightenment descends upon the ideal that has turned down worries and toils of the day.[44] In Sogda secular type of sculpture diverges from orthodoxy of Buddhist canons and receives thereby an unobstructed exit into independent type of plasticity. In sculptural terra-cotta in this respect numerous lessons from Hellenism were distinctly pronounced.

In monumental paintings of the 6-7th century AD Sogd and Oostrushana not only succeed in absorbing external influences, but of their own accord extend a certain amount of influence on contiguous art cultures, like in fabrics of Iran and Byzanthium, in thoreutics upon the ancient Tiurks and other steppe peoples of Eurasia as well as upon the Uigoors of Sintzian and China, while pictorial paintings of Central Asia of the 5-7th AD leave far behind them the Sasanide Iran. In artistry of Sogd mythological and poetic attitude to gods as beings, which are identical to all humans, for a long time since has predominated over an obstract pristly modes of interpretation and this had its bearing on that specific unconstrainness with which compositions on various subjects, having on direct connections between themselves whatsoever, used to be grouped together upon one common wall. As such, in reality no inconographic paintings exist in the wall-paintings of different temples and dwellings of Pendzhikent where epos predominates in majority of cases, while in the sphere of mass terra-cotta productions this process was retained to a certain degree and thematic statuettes still retained their archaical appearances, because only their faces were reproduced by means of a mould. However, as it is, even here a wide degree of dissemination is accorded to natinal types where they radiate with happiness or with an ironical grin on their countenances, where they transmit feelings of lament or suffering. A multi-coloured change of costumes and headgear is taking place, while people of different nationalities, races and tribal affiliations during this period flock to this Central Asian town in which everyethnic type finds in tetra-cotta his own response.[45]

Pictorial paintings of Sogd, in accordance with their own nature, principally represent a secular type of artistry as it happens to be quite spontaneous and distinctive in which strict compositional lines and harmony of forms gladden one's eye. In its compositions chiefly predominate not culture or an accidental possibility of observing one thing or another, but proportionality that was dictated by the very idea of a masterpiece and, emanating out of this, an unobstructed sense of equilibrium is matched with the ultimate set-up of a drawing since, pictorial palette, graphical sketch and dimensional plasticity of relief always tend to co-exist in one and the same object and in this lies the secret of that specific synthesis of art by which every sphere of art in Central Asia was marked, even in the mediaeval ages

when it possessed an ability to dissolve within itself influences of all other schools of art.

Epical spirit of artistry in Central Asia of the 5-8th centuries took an upperhand over the priestly dogmatic of Buddhism, Hinduism and official Zoroastrism and, as a result of this, preconditions were set up for useful reversion to fairy-tales, legends and parables not cnly of their own origination, but all those that came from India as a source of numerous mythological images and proximating ideas which, at a later period, were adopted by literary and art articles of different Moslem countries.

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43. In this article I practically make no reference to different articles of jewellery from Tillya-tepeh just as any other art creations of the ancient Afghanistan, although they also play a vital part and are closely related to our theme. I can only mention here, that all these treasures of "nameless sovereigns" throw an absolutely new light quite unexpectedly on cross-roads on which met and merged together artistic trends that emerge out of the depths of Siberia and fuse with Baktrian, Parthinian and Hinduist art at the time of a break-through the Pamirs and Baktria to eastern boundaries of Parthia.
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List of Abbreviations

VDI—Veetnik drevnei istorii (Herald of Ancient History)

GMINV—State Arts Museum of Oriental Nations.

KCMA—Brief reports of Archaeological Institute of the Academy of Sciences of the USSR.

SGE—Reports from the State Hermitage.

TRANSMISSION OF TECHNOLOGY OF ARTS AND CRAFTS BETWEEN INDIA AND CENTRAL ASIA DURING THE MEDIAEVAL PERIOD : SOME ASPECTS

M. K. PAL

The vast area stretching from the eastern shores of the Capian Sea to the great wall of China is sometimes referred to as Central Asia. Geographically it is divided into two parts, mainly by the Pamirs. The western part, now under the Soviet system, comprises the ancient regions of Khorasmia and Sogdiana, and the eastern part, now occupied by the Chinese, includes some of the well-known ancient kingdoms, such as Khotan, Turfan and Kucha. Collectively, the eastern region is also known as Serindia. The cultural division shows that the art of the western part of Central Asia imbibed definite elements of forms, iconography, and motifs of Sassanian and Hellenistic origin, slightly tinged with Indian concepts, while in the art of the eastern part a 'melting pot' has been of currents of various art styles, e.g. Hellenistic, Sassanian, Gandharan, Tibetan and Chinese. The main stream of art was largely based on Buddhism which played an active role in Central Asia from the second century A. D. to the tenth century A.D.

The cultural exchanges between India and Central Asia have all along been bilateral. The era of the Achaemenian State and of Alexander the Great should be regarded as a special phase in the history of the relations between Central Asia and India. Some regions of Central Asia namely Bactria, Soghd, Parthia and Khwarazm and territories of North West India (the Gandhara region and the Indus territories) became parts of the same empire. Indian soldiers joined the Achaemenian army. In the second century A.D. when the Scythian (Śaka) tribes migrated from Bactria to North India via the Pamirs, they carried with them several elements and traditions of Central Asian culture. There are, for example, the distinctive iron swords discovered at Taxila and specific disc-shaped bronze mirrors, which were popular in Central Asia. Men from Central Asia also came to live in India. They embraced Buddhism and even held official posts. The Kushana sculptures from Mathura show the definite influence of Central Asian traditions particularly in weapons, clothings and other examples of arts and crafts. A case in point is the distinctive Indo-Scythian helmet worn by the statues of Kings from Mathura. The Kushana pantheon, aptly represented on the Kushana coins, testifies to the spread of Zoroastrianism (current at that time in Central Asia) and was co-existence with the Indian religions of Buddhism and Saivism. In the early period of the Kushana empire, the main direction of cultural exchange was from Central Asia to India. It was later, in connection with the spread

of Buddhism, that the impact of India's cultural traditions became quite substantial.

The second wave of vigorous cultural exchanges between India and Central Asia can be traced during the period between 13th-15th centuries A.D. when the Turks descended upon India. The Turkish invaders coming to West Asia during the 9th and 10th centuries A.D. from their central Asian home-lands and accepted Buddhism and Hinduism. During this period, trade grew, and political contacts became closer. Waves upon waves of immigrants came to India from Central Asia, and many of them were technicians, musicians, artists and craftsmen. The interaction of the Turks with the Indians who held strong religious beliefs and had well developed ideas of art, architecture and literature resulted, in the long run, in a rich development. Several trends towards mutual understanding and integration are to be found not only in the fields of religious beliefs and rituals, architecture and literature, but also in the fields of arts and crafts, particularly music. When the Turks came to India, they inherited the rich Arab tradition of music which had been further developed in Iran and Central Asia. They brought with them a number new musical instruments, such as the *rabalo* and *Sārangi*, and new musical modes and regulations.

In the field of technology, the greatest impact on India was in architectural decorations. There is remarkable similarity between the monuments of Central Asia and those of India, in the mediaeval period. The Qutab Mīnār of Delhi appears to have been modelled after the earliest minaret towers of Central Asia. The sloping walls of Ghiyāṣu'ddīn Tughluq's tomb in Delhi (early 14th century A.D.) have their origins in the Shir-Kabīr tomb-mosque of the 10th century in Mashad. In the latter building, we also find the recessed squinch arches, which became so common in India. The stalactile decoration in the octagon supporting the semicircular dome, which is found in our buildings of the 14th and 15th centuries A.D. may be seen in Abúl Faḍl's mausoleum at Serakhs of the 11th century A.D. In Serakhs of the same period, we find multifoliated arches and half-domed squinches, which may be seen in any number of Mughal monuments in India. The early Mughal monuments like the Humāyūn's tomb in Delhi show the employment of double dome, the earlier examples of which are met with in Samarqand in the early 15th century A.D.

The decorative motifs in Indian Islamic art are also deeply influenced by the Central Asian and Iranian examples. For instance, special mention may be made of the glazed and coloured tile-work which started appearing on Indian monuments under Central Asian influence. On the other hand, the patterns of tile decorations appear to have been influenced by Indian decorative forms, the *jāli* patterns of temple architecture being transformed into blind tracery panels decorating the mosques and mausoleums. The delicate marble relief work and inlaid polychrome pietra-dura in the tomb of Ítimūd-ud-Daulah, father-in-law

of Shān Jahān, is in fact a counterpart of decorative designs of Central Asia which were executed in delicate designs in tile work. This is also corroborated by the evidence available in the list of several crafts given bp Abūl Faḍl. It is assumed that the crafts like glazed wares, glasswares, textiles specially silken items were imported commodities from Central and West Asian countries and China, and obviously obtained through the Kābul, Qandhar route or through the coastal ports.

The process of transmission of technology belween India and Central Asia in the field of arts and crafts has also been noticed in the arts of Jade carving and carpet-weaving specially during the Mughal period. It is known that Jahāngīr had acquired a number of jade specimens including vessels which originally belonged to Ulugh Beg, the grandson of Tīmūr. The love for the Timurid art and culture probably prompted the Indian Mughal emperors to popularise jade craft in India. There is no doubt that these jade specimens in the possession of Jahāngīr must have served as prototypes for Mughal lapidaries to produce jade specimens with similar type of ornamentation, motifs and forms. The similarity of forms, motifs and calligraphic ornamentation on jade vessels of early Jahāngir period would very well suggest that the Mughal jades in India were fashioned after the Tīmurīd tradition, even though the Mughal craftsmen did make slight modifications here and there to exhibit their super craftsmanship and ingenuity.

The art of carpet weaving, orginally a gift from Central Asia, probably entered India at some as yet unknown date, prior to cira 1300 A.D. From the sources available, it is known that at least a few varieties of carpets produced from the fibres of silk, wool, cotton, flax and hemp, or of thin admixtures were available in the Sultanate of Delhi (1200-1400 A.D.) of the materials used in carpet-weaving in Sultanate period, special mention may be made of silk which was an imported commodity from Central Asian countries and China, obtained through Kābul-Qandhār route or through the coastal ports.

During the reign of Emperor Akbar, the craft of carpet weaving saw the hey day of its glory. Akbar introduced rollerbeam or the improved veriety of carpet loom, possibly from Central Asia. Even some of the significant designs in carpet weaving, specially tying of knots (*nagshbandi*), were initially borrowed from Central Asia and, in course of time, their design and motifs were adopted in other floor coverings like *durries* and *shaṭranjis* with slight modifications in line and form.

From the data available with us, it may be well assumed that trade played a vital part in the process of transmission of technology between India and Central Asia during the mediaeval period. Situated at the cross-roads of ancient trade ways, Central Asia was a trans-shipping point in India's trade with China, Russia

and other countries of the West, and Central Asia itself was the first commodity market for Indian goods including textiles. Undoubtedly, the art of Indian weavers influenced greatly the expansion of the assortment of the fabrics produced by the Central Asian craftsmen. This inter-mingling of processes in the transmission of technology perhaps started with the establishment of a Turkish Empire in North India in the 13th-14th centuries A.D. which resulted in the formation of a wealthy class of nobles and warriors having Central Asian roots. The usual desire on the part of this new class of consumers to preserve the material culture of their home-land obviously led to an increase in imports of arts and crafts items from this region into India. Some of these, items were decorative or curative, and made of alloy which, on account of non-availability of some constituents, could not be fabricated in India.

From the above it is evident that trade led not only to exchange of goods and technologial ideas between India and Central Asia, but also of elements of culture. It would be inaccurate to hold the view that the Indians alone contributed to the material culture of their traditional neighbours. It was all the time a two-way traffic. The Indian craftsmen acquired advanced skills of craftsmanship from their fellowmen in Central Asia. Similarly the method of growing cotton and cotton weaving spread from India to China and Central Asia. However, the Indian contribution seems to be more important in art and culture than in the other fields. But in no case the material culture which developed in the neighbouring countries was a replica of the Indian material culture. Just as India retained and developed its own personality in spite of foreign influences, so also did the countries in Central Asia evolve their own indigenous material culture by assimilating the Indian elements.

CENTRAL ASIA AND INDIA–CONTACTS IN ART

KRISHNA DEVA

North-West India came in contact with the adjoining regions of Central Asia comprising Bactria, Sogdia, Parthia and Choresmia (*Khwaezm*) when they all came together under the imperial umbrella of the Achaemenians during the 6th and 5th centuries B.C. These contacts continued ever since and grew stronger and more intimate under the rule of Kushanas whose empire extended from Central Asia across Iran, Afghanistan and north-west Indo-Pakistan sub-continent through major tracts of Western and Northern India.

Many Kushana officers serving in India hailed from Central Asia and are known from Buddhist votive inscriptions as donors or founders. Some of the early Kushana sculptures from Mathura reveal clear impact of Central Asian physiognomy and stance, headgear and garments, and weapons and furniture. The imagery of Kushana Sūrya is directly derived from Central Asian and Iranian models. Though king Kaniṣka had strong personal inclination towards Buddhism and is known to be one of its greatest patrons, he portrayed on his coins an eclectic pantheon or Iranian, Greco-Roman, Bactrian and Indian divinities affiliated to such diverse sects as Buddhism, Śavism and Zoroastrianism, the last being popular then in Central Asia.

The cultural exchange between India and Central Asia was indeed a two-way traffic. The commonly held view that art and culture always radiated from India and that Central Asia was invariably at the receiving end has to be modified in the light of recent discoveries in Soviet Central Asia due to the efforts of Soviet scholars like S.P. Tolstov, M.E. Masson, V.A. Shishkin, V.M. Masson, B. Gafurov, M. Asimov, G.M. Bongard-Levin, B.Y. Stavisky, B.A. Litvinsky, Y.A. Davidovich, T.I. Zeymal, E. Gulyamova, L.I. Albaum and others. The latest researches of Soviet scholars led by G.A. Pugachenkova have proved that Bactria developed its own school of Kushāna art quite independently and before the formulation of the Gandhāra art and that the Bactrian school had its distinctive characteristics including a stress on secular themes like portraiture and pageantry, dance and music. This finding is primarily based on a remarkable series of painted clay heads and figures excavated at Khalchayan in Uzbekistan which represent virile realistic portraits. Since these are affiliated to neither Hellenistic, nor Parthian, nor Indian art, there is a strong presumption for the existence of an original school of Bactrian art.

An ancient town site with a castle antedating the 2nd century B.C., Khalchayan also has yielded pre—Kushana and Kushana coins, terracotta figuri-

nes, wall paintings and sculptures. A clay medallion here shows a ruler wearing a peaked cap seated on a high throne between a pair of lions, which seems to have inspired a well-known Mathura Royal half of the 1st centrury A.D. and containing golden ornaments for the head, ear-rings and buckles, resembling those depicted in Gandhāra art, besides a gold plate and ten gold bars, bearing Kharosthī inscriptions in the Prakrt of Northwest India recording the wright of the bar and the name of its owner.

While Termez in Uzbekistan has yielded a frieze showing seated Buddha with acolytes in the Gandhara style, the neighbouring site of Airtam has interesting secular figures of female musicians amidst acanthus foliage, combining features of the Gandhāran and the Bactrian sculputural styles, the latter of the Khalchayan vintage.

The discoveries at Kara-tepe near Termez register further assimilation of Indian influence in Central Asia. The site has a large rock-cut Buddhist monastery adorned with well-paintings, plaster reliefs and huge images of the Gandhāra style. The cave architecture, which is unknown in Central Asia and is so typical of India and the finds at the site lids carved with lotus flowers and umbrellas as well as Sanskrit inscriptions in the Brāhmī and Kharoṣṭhī scripts clearly reveal the impact of Indian culture. The lay-cut of the cave with round—about corridors, however, follows the regional building tradition of Central Asia.

Zang-tepe, 30 kms. south of Termez, has a fortified castle of the 1st century B.C., rebuilt during the 5th century A.D. Excavation here yielded 7th century birch-bark Buddhist texts portrait. Khalchayan also has figures of nobles and courtiers whose headgear and clothing inspired Mathura and Gandhāra sculptures of the Kushana period. The art of Bactria with its centre at Khalchayan indeed developed prior to the Gandhāra art and some of the elements of the former like the technique of portraiture and its distinctive weapons, furniture and garments influenced the early Kushana art of India.

The site of Dalverzin-tepe in South Uzbekistan has a Buddhist shrine dating from the 1st century A.D. The shrine containing a stupa is embellished with remarkable sculptures in plaster and clay and has two parts, one exclusively devoted to representations of the Buddha and Bodhisattavas and the other combining with Buddhist secular figures probably representing the ruler and his family. The religious and the secular sculptures belong to two distinct styles, the first pertaining to the Buddhist Gandhāra style of India and the second to the Bactrian style of Khalchayan. From this site also come many art objects of Indian workmanship[1] such as an ivory comb carved with an aristocratic lady attended by a servant on one side and a couple riding on elephant and guided by a maid on the other side and ivory chess pieces representing an elephant and a humped bull. The discovery of chess pieces shows that the Indian game of *Shatranj* (*caturanga*)

had travelled to Central Asia quite early. Another notable find here was an treasure of gold objects dating from the latter in the Brāhmī scripts which obviously came from India.

It is worth noting that many elements of Indian culture like art and script, and Buddhist religion and texts travelled to Central Asia but these were assimilated in the local cultural stream. In Bactrian sites are found bilingual inscriptions written in the Brāhmī as well as in the Kushana script which was adapted from the Greek. The Bactrian scholars of the Kushana age translated Buddhist texts; from Sanskrit but gave their own gloss and interpretation. These Bactrian monks[2] also played an important role in the propagation of Buddhism in the Far Eastern countries. A Tukhāra monk called Ghosaka was one of the scholars who wrote commentaries on the three Piṭakās which were approved by the Buddhist Council held during the reign of Kaniska and the same monk is credited with the authorship of *Abhidharmāmṛta-śāstra*. According to the Chinese sources Dharmamitra, a monk from Termez, wrote a commentary on the *Vinayasūtra* and translated texts of the Vaibhaśika school into Tokharian language. Many Buddhist texts were translated into Chinese by the Central Asian monk scholars who played a vital role in strengthening cultural links between India and the Far East.

The cultural exchange between India and Central Asia which was brisk during the Kushana period continued for a few centuries, as attested by the excavations at Adzhina-tepe, Varakhsha, Penjukent and Zang-tepe in the Soviet territories.

A spacious Buddhist complex of the 7th century A.D. has been exposed at Adzhina-tepe[3] in Tadjikistan comprising a temple and a monastery. The temple has a stūpa in the court-yard, approached by stairs on the four sides, leading to processional passages—a design popular in the Gandhāra territory. The niches of the stūpa contain, painted images of the Buddha in sizes, small to colossal, and in various postures and gestures. Notable among these is a 12 metre (39 feet) long reclining figure of the Buddha's *parinirvāṇa* which is comparable to similar colossal images known from Kusīnagara and Ajanta Cave 26.

The monastery at Adzhina-tepe had the familiar Indian plan of residential cells for monks and larger halls for other monastic requiremeuts, enclosing an open courtyard. The influence of local art traditions, however, is unmistakable on the decorative embellishments of the Buddhist establishment at Adzhina-tepe.

Adzhina-tepe is also known for its painted clay sculptures of religious themes including images of the Buddha and Bodhisattavas as well as secular ones depicting figures of monks and layment, the latter revealing traits of the Bactrian art. Among religious figures here that of prince Siddhārtha bidding farewell to

his horse Kanṭhaka is quite touching and is reminiscent of the theme so lovingly depicted in the Buddhist art of India. Many of the clay images here are stylistically comparable with those at the Afghan sites of Kunduz and Fondukistan.

An earlier Buddhist establishment dating from the 1st to 3rd centuries A.D. has been recently excavated by the Soviet scientists at Fayaz-tepe. not far from Kara-tepe, noticed, earlier. Like Adzhina-tepe, the complex here comprises of a monastery and a temple with a stūpa, adorned with Buddhist paintings and sculptures of clay and alabaster of the Gandhāra style. The paintings include representations of devotees bringing offerings to the Buddha, while a sculpture portrays the Buddha seated under a tree, surrounded by monks, a theme popular in Indian art. This site has also yielded Prakrit inscriptions in Kharoṣṭhī, bearing fragments of Buddhist sayings.

A Sanskrit Buddhist manuscript from the ancient site of Merv in Turkmenia was found sealed in a jug with 5th century coins and statuettes of the Buddha. The manuscript contained 150 palm leaves, many of the paginated, of c. 5th—6th centuries A.D., bearing Buddhist texts including *Suttavibhanga*. The text provides the name of the scribe who calls himself a Sarvāstivādin. This is a fact of paramount significance attesting to the dominant influence of the Sarvāstivāda sect of the art and religious beliefs in Central Asia.

Varakhsha near Bukhāra is a late Kushana site having a 5th century fortified castle with subsequent reconstructions. The Kushana layers yielded terracotta figuriness of the Iranian goddess Anahita and representation of men, women and animals. The 6th century wall paintings on the castle represent hunting scenes showing elephant riders hunting leopards (Fig. 1). This theme is palpably Indian and though the depiction of elephants is not quite realistic, their riders are distinguished by Indian dress and physiognomy. A painted textile design showing a pair of pigeons carrying a pearlgarland (*muktāmālā*) in the beaks is also an Indian theme and seems to be a favourite motif in Central Asia, as it is also met with at Kizyl in Eastern Turkestan.

Pendzhikent,[4] situated 70 kms. east to Samarqand in Tajikistan was a fortified capital town with shrines and houses ornamented with wall—paintings and stucco and wooden sculptures, dating from the 7th-8th centuries A.D. A painting here portrays a blue dancer wearing tiger skin with a trident behind, representing obviously Indian Śiva as Nīlakaṇṭha and Nateśa in alīdha pose Fig. 2, 3) which is portrayed in a contemporary sculpture from Karnataka in India. Paintings also depict here a tall beautiful female wearing flying sashes and ploying on a harp of the same form as seen on the Lyrist type coins of Samudragupta (Fig. 4) later half of the 4th century, and a group of four female musicians wearing floating skirt with high waist, curiously resembling the ladies represented in Indian paintings of the Rajasthānī and Pahārī Schools (Fig. 5, 6).



Fig. 1. Hunting on elephants (Wall-painting) : Varakhsha



Fig. 2 Painting of Śiva from Pendzhikent (redrawn)

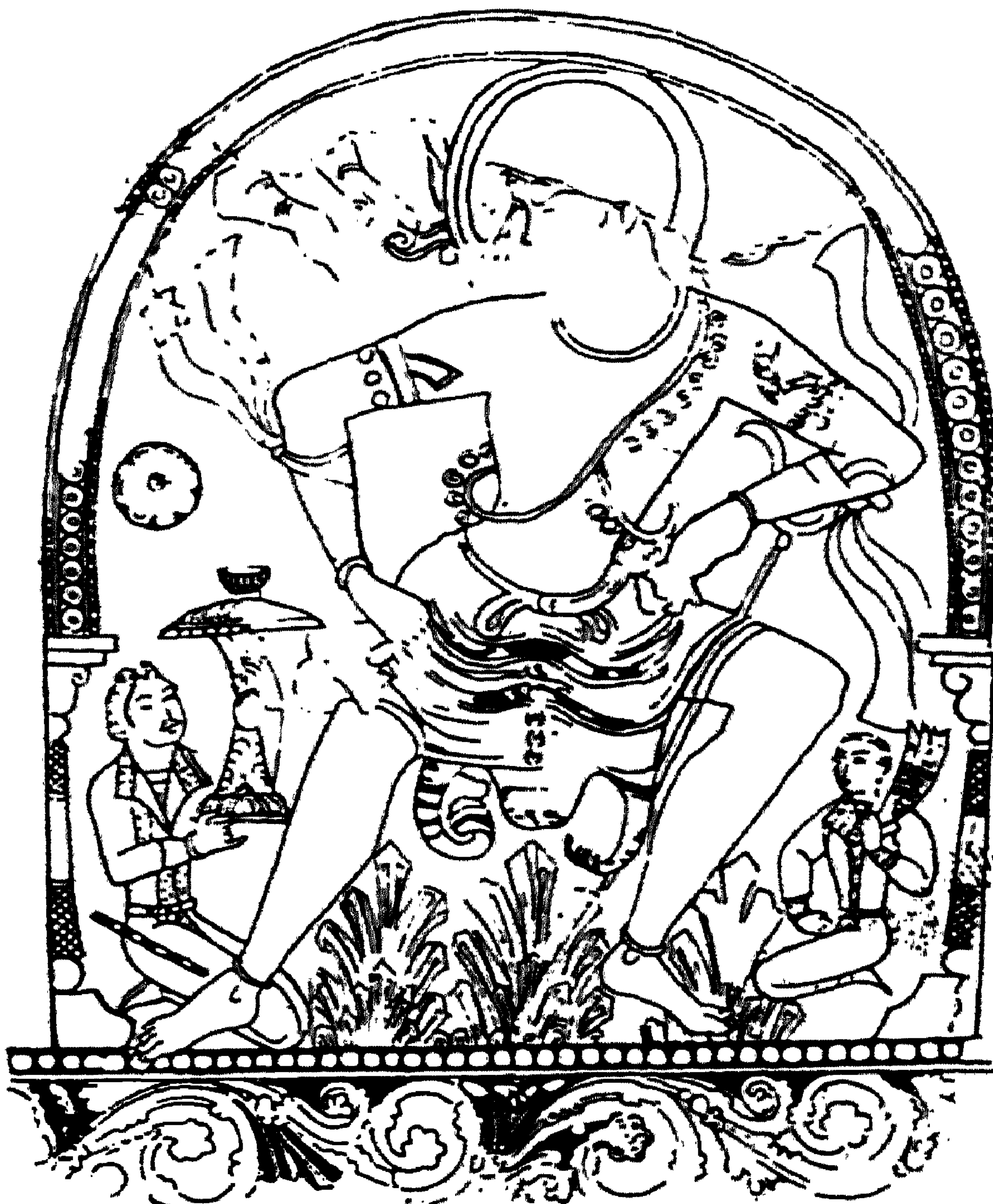


Fig. 3 Lyrist type coin of Samudragupta showing king playing on harp.



Fig. 4. Girl playing the lute : Airtam figure

Wooden sculptures from Pendzhikent include Indian style females (Fig 7) and divinities. The latter represent what looks like a solar deity riding a chariot driven by a pair of horses and a goddess (probably Nānā) seated on lion holding the orbs of the sun and the moon. A large stucco sculpture here depicts a three-headed and six armed deity, reminding one of Hindu Trimūrti (Fig. 8). The art and iconography of Pendzhikent thus reflect strong Indian impact.

The town site of Afrasiab situated in the oldest part of Samarqand in Uzbekistan was founded in c. 5th century B.C. and continued to flourish with

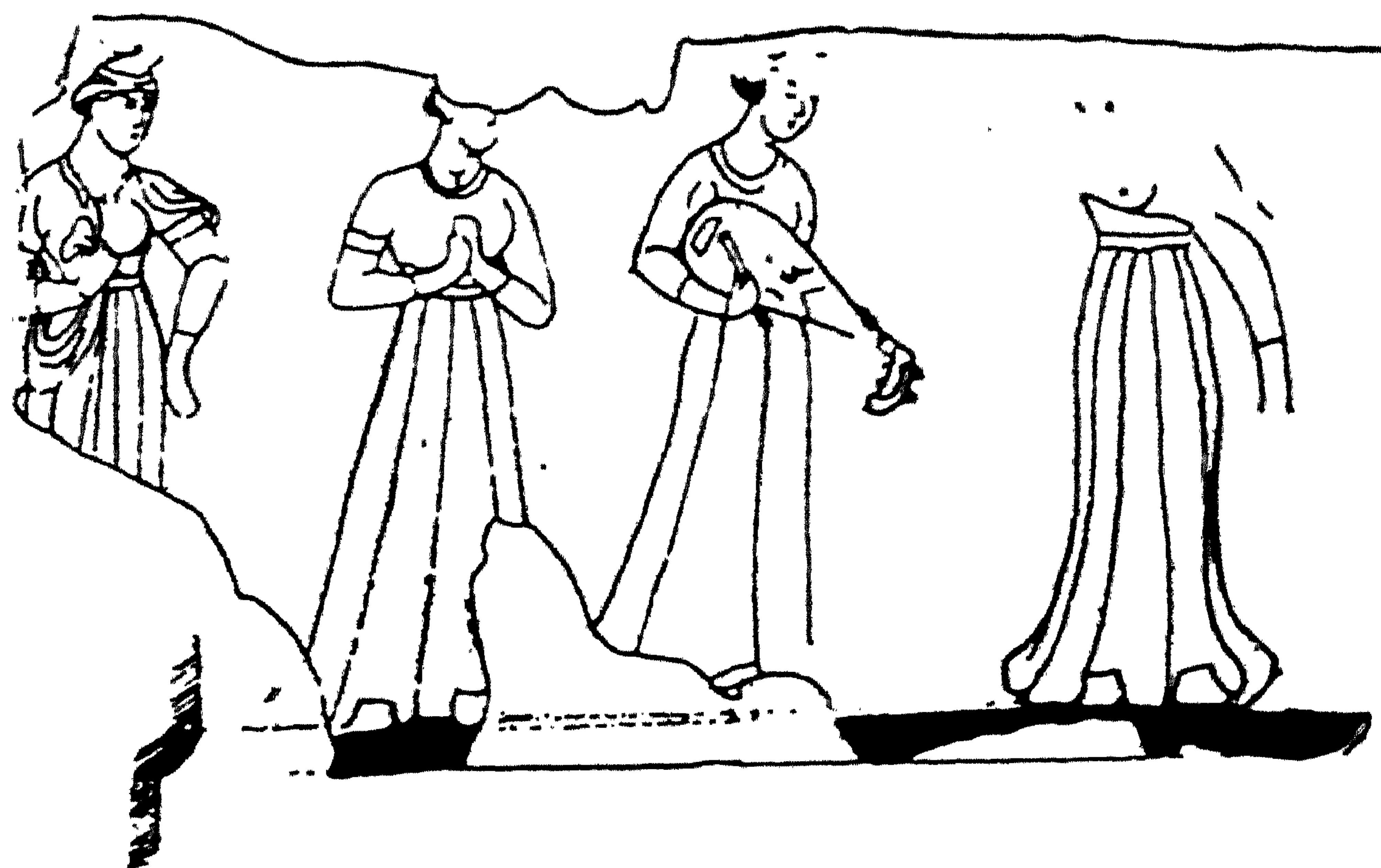


Fig. 5 Female musicians in flowing skirt from Pendzhikent (copied from G. Frumkin, *Archaeology in Soviet Central Asia*, Brill 1970)

some vicissitudes till the 13th century. It was a famous centre of Kushana culture during 1st to 3rd centuries A.D. and after suffering devastation in the 4th century rose again between the 5th and 7th centuries under the patronage first of the Ephthalites and then of the Turks. The Bhinese pilgrim Yuan Chwang has left a glowing account of the town. A 7th century residential house in the centre of Afrasiab is painted with a resplendent wedding scene showing a bridal procession of horses, camels and huge white birds preceded by a richly caparisoned elephant. The associated Sogdian inscription says that the bride accompanied by mounted dignitaries and retainers in gorgeous attire is coming from the Choganiyan region to Afrasiab to marry its ruler. It is indeed noteworthy that no pageantry or procession was regarded colourful enough in Central Asia unless it was led by the Indian elephant, who was imported together with the trainer mahout.

The site of Koy-krylgan-kala in Kwarezm[5] with a concentric town plan flourished between the 4th century B.C. and the 1st century A.D. Among its rich archaeological finds are included terracotta figures of divinities including Anāhitā and a madonna suckling a child, human heads, horses and a monkey with its baby, revealing evident familiarity with India.

The neighbouring site of Topark-kala was a town site with a magnificant castle of the K͟hwārazmian kings. Founded in the 1st century A D., the town survived till the 6th century. The three-storeyed castle, extending over an area of 11000 square metres, contained many palatial halls of which the Imperial Hall, measuring 280 square metres, with colourful wall paintings and large statues of clay and alabaster, representing probably the ruling chiefs, their family and



Fig. 6 Rajasthani illustration from Bihari Satsai, 18th century, (Courtesy, Bharat Kala Bhavan, Varanasi).

guardian deities, is noteworthy. Some of the paintings are reminiscent of Ajanta. There was also a Hall of Black Guards which some scholars consider to be representations of South Indians. The site also yielded Khwārazmian documents on wood and leather and a large quantity of Kushana coins.

The contact of Central Asia and India in the field of art has a bearing also on the wider question of the origin and nature of the Gandhāra art. Did the Gandhāra art owe its inspiration to the Roman art? Or to the Hellenistic art? Or to the Parthaian art? Or to the Indian art? All these art styles contributed



Fig. 7. Female figure of wood from Pendzhikent



Fig. 8 Natesa from Pattadakal, Karnataka, 8th century. (Courtesy. American Institute of Indian Studies, Varanasi)

their mite to build up the edifice of the Gandhāra art and there was yet another potent factor which played an important contributory role, viz, the Bactrian art which has recently been investigated and rightly projected by the Soviet archaeologists.[6]

It is now widely recognized that the Kushana art transcended the spatial and temporal limits of the Gandhāra art. In the vast Kushana empire stretching from the Aral to the Indo-Gangetic plains there were many regional styles of art

sustained by divergent local beliefs and traditions in Khwārazm, Sogdia, Bactria, Parthia and Gandhāra, not to mention the main land of India. Flourishing in the territorial units of the same empire, these regional styles of Kushana art interacted among themselves. Further, the influence and fall out of the Kushana art outlasted the tenure of the Kushana empire and reverberated in Central Asian lands till the 7th-8th centuries A.D. Moreover, unlike the Gandahra art which was mainly Buddhistic in intent and content, the regional art in Central Asia, particularly the Bactrian art was more secular than religious, as is amply demonstrated by the art specimens from Airtem, Adzhina-tepe, Varakhsha, Afrasiab and Pendzhikent, discussed above,

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KAMĀLADDĪN BIHZĀD AND THE 16TH CENTURY INDIAN MINIATURE-PAINTERS

A. MADRAIMOV

The artistic culture of Khorasān during the late half of the 15th century and the beginning of the 16th century produced quite a galaxy of outstanding poets, scientists, historians, artists and calligraphers, such as Ālīsher Navoī, Ābdarrahmān Jāmī, Mīrkhond, Ghiyāşddīn Khondamīr, Kamāladdīn Bihzād, Shāh Muzaffar, Sultān Ālī Meshhedī, Mīr Ālī Heravī and the like. It had assimilated the achievements of almost all the centres of the middle eastern cultural and scientific thought, the foremost of them being Samarqand, Bukhāra, Tabrīz, Shīrāz and other cities. The flowering of this culture unfortunately decreased subsequently at later times. Yet an earlier upward growth of it had great influence on the centres where its traditions were to be revived.

Kamāladdīn Bihzād (1455-1537) has a distinct place in history as the founder of the so-called Herat School of miniature-painting of the latter half of the 15th century, his work having had great beneficial influence on the development of fine arts in the whole region of the Near and Middle East. In his long life or over eighty years, this artistic genius had trained a new generation of miniature-painters, himself having created many unique miniatures, the real masterpieces of this type of fine arts.

Kamāladdīn Bihzād was born in an artisan's family in 1455. In his childhood he remained an orphan. Ālīsher Navoī (1441-1501) picked him up rendering him every help and support. Bihzād was taught painting by a painter named Mirak Naqqash, or Amīr Rūhullāh, who was Sultān Husīn Mirza's chief librarian. Soon Behzad attained perfection in the art of painting and commenced his work at the personnal library of Ālīsher Navoī who played a considerable role in the formation of his outlook. Soon he attracted the attention of his contemporaries and became the head of an artistic studio to create and illustrate manuscripts. This studio was to develop later into some kind of an academy of arts to be called "Nigoristānī Bihzād". As early as in the beginning of the 16th century, Bīhzād had become famous throughout the Middle East. Herat having lost its leading role, Bihzād moved to Tabrīz where he became the chief of the Court Library. The last years of the great master's life passed in his native city of Herat, and he died in 1537.

The artist's contemporaries highly appreciated his creative genius, comparing him with the legendary painter Mani, calling him a "Miracle of the Age",

"Head of Talents", and considering his creations to be the summit of perfection. Bihzād gave training in miniature-painting to a generation of painters, such as Qāsim Āli, Mullā Yūsuf, Dust Devana, Mīr Sayyid Ālī and the like. Numerous manuscripts illustrated by Bihzād and his pupils have come down to us. These include Sādī Shīrāzi's *Būstān* and *Gulistān*, *Hamse* by Nizāmī Giandjevī and Amīr Khusraw Dehlevī; Sharafaddīn Ālī Yazdī's *Zafar nāme*, works by Ālīsher Navoī and Àbdarrahman Jāmī, etc., Apart from miniatures for manuscripts, Kamāladdīn Bihzād created a number of independent samples of portrait-painting. His portrait representations of distinct historic figures, such as Àlīsher Navoī, Sulṭān Husaīn-Mīrzā, Àbdarrahmān Jāmī, Shaybanī-Khān, etc., have expressive individual characteristics, having played an important role in the development or portrait-painting in the Middle East.

The precise number of miniatures created by Bīhzād himself or under his guidance has not yet been determined by investigators of the great master's life and work.[1] The famous creations of the great artist are kept in various museums and libraries of Great Britain, USA, France, Ireland, GDR, Egypt, Turkey, Iran, etc., In the USSR, numerous miniatures created by Bīhzād and his school are kept in the M. Ye. Saltykov-Shchedrin State Public Library, the Leningrad Branch of the Institute of Oriental Studies of the USSR Academy of Sciences, the Moscow State Museum of the Eastern Peoples' Art, the Abū Ranīhān Birūnī Institute of Oriental Studies of the Uzbek SSR Academy of Sciences in Tashkent, and in other eastern manuscript repositories.

A vast range of literature has been dedicated to the life and work of this artistic genius called "a Second Mani" in the East and "Raphael of the East" in the West. Of these, we mention only a few works, particularly those of the Corresponding Member of the Uzbek SSR Academy of Sciences G. A. Pugachenkova[2]. Prof. A. Yu. Kaziyev[3], Hamid Suleiman[4], K. Kerimov[5], N. Narkulov[6], I. G. Nizamutdinov[7], M. M. Ashrafi[8] and U. Pulodov[9], which shed new light on Kamāladdīn Bīhzād's life and work.

This article examines the attitude of the 16th century Indian miniature-painters towards Kamāladdīn Bihzād's artistic heritage. The subject is not of casual selection, because in some narrative sources on the history of North India. we can often find the names of numerous figures of Herat culture and literature of the latter half of the 15th and the beginning of the 16th centuries, such as Àlīsher Navoī, Ābdarrahmān Jāmī, etc., It is a matter of common knowledge that, after Herat lost its political independence, the well known historian Ghiyāṣaddīn Khondamīr, the physician and poet Yūsuf Yūsufī Heravī, the Historian of law, Sheikh Zaīn Khawafī, and a number of others, moved to Bābur's court in India. Apart from them, the poet Qāsim Kahī Samarqandī spent most of his life in India too. All this formed a basis for certain influence of Khorāsān's cultural achieve-

ments on the culture that began developing in North India in the first quarter of the 16th century.

Ẓahīraddīn Muḥammad Bābur and his successors, Naṣīraddīn Muḥammad Akbar, highly valued the artistic and cultural achievements of Maverannahr and Khorasān, collected and carefully kept their unique manuscripts in the libraries, striving for repleting their collections at the expense of new entries. Thus, drawing on the evidence of the Azerbaidzhanian miniature-painter Ṣādiq-Beq Afshar, Prof. A. U. Kaziyev comes to the conclusion that in the 16th century India, miniatures of the Middle East painters were valued higher than elsewhere.[10]

Our observations testify to the fact that there was a large-scale and active artistic and cultural contact of North India during the 16th century with the peoples of the Middle East region—Central Asia, Afghanistan etc., Qādī Aḥmad's treatise on calligraphers and artists mentions the names of four miniature-painters, to wit Mīr Manṣūr Muṣawwir his son Mīr Sayyid Áli, Mullā Ábdaṣṣamad and one of "unsurpassed pupils of Ustād Bihzād", the painter Dust Devona, all of whom went to India.[11] The 16th century historian Bayazid Bayat, mentions the names of two more miniature-painters, Maulānā Darwīsh Muḥammad and Maulānā Yūsuf as well as a bookbinder, Maulānā Fazar, and a master of spraying gold, Ustād Weis.[12] It is well-known that the painter, Farruh-Beq Kalmak, came to India from Kābul. Besides, Jahangīr giveṣ evidence that the father of the famous miniature-painter, Abūl Ḥasan called "Nādir az-Zamān", the painter Aka Riẓā, also came to India from Herat.[13] Historians point out that the calligrapher Muhammad Bāqir, the son of a well-known master of the Nastaliq handwriting, Mīr Álī Heravī, who had spent most of his life in Bukhāra, came to India too, having brought a manuscript copy of Ábdarraḥmān Jāmī's work with him, prepared by his father and illustrated with manuscripts by Central Asian artists. It should be noted specially that it was owing to their attempt at running away to India that two miniature-painters, 'Abdū 'Azīz and his pupúl Kamāl, were severly punished by Shāh Tahmāsp, who cut of their noses with his own hand.[14]

At the present time, specialists have found some manuscripts illustrated by Bihzād and his pupils which were once kept in the court libraries of Bābur and his successors. Nowadays they are lying scattered in various manuscript repositories of the world. Of them, the following manuscripts deserve special mention : (1) Sharafaddīn 'Alī Yazdī's manuscript, of *Zafar nāme* containing eight Bihzad's miniatures. There is Jahangir's inscription in it; (2) Niẓāmī Giandjevi's manuscript of *Hamse* from the British Museum containing sixteen miniatures, of which seven bear Bihzād's signature on the margins. There is Jahangir's inscription in this manuscript, too.[15] (3) A copy of the manuscript of Amīr Khusraw Dehlevī's poem, *Khusraw and Shirīn* which is kept in the Sālār Jung Museum in the Indian city of Hyderābād. It contains two miniatures of the Herat school[16]; (4) At this same Museum, there is one more manuscript containing five miniatures created by

Bihzād's pupils Dust Devona and Maḥmūd Muzahhib, probably, in Herat; (5) Alisher Navoī's manuscript of "*Hamse*" created in 1485 and specially designed for the prince Badīāzaamān Mīrzā. Nowadays the poems of this manuscript are odd, being kept in the Bodleian and the Manchester University libraries[17]; (6) Alīsher Navoī's manuscript of "*Hamse*" which was copied in 1492 in Herat and is being kept now in the Windsor court library under Inventory Number 65[18]; (7) Alīsher Navoī's manuscript of "Collected Dīvān" which was copied at the end of the 15th Century in Herat and is being kept now in the Windsor court library[19]; (8) 'Abdarraḥmān Jāmī's manuscript of "*Dīvān*" copied in 1515 by Sulṭān 'Alī Mashhadī in Herat and illustrated with miniatures by Maḥūd Muzahhib.[20]

These manuscripts and others collected in the court library funds were models which were destined to be the object of studies for the 16th Century Indian miniature-painters. The aforementioned manuscripts containing creations of Kamāladdīn Bihzād and his pupils, as well as the fact that several painters of his circle including his three direct pupils, Dust Devona, Maulānā Yūsuf and Mīr Syyid 'Alī, lived and worked in India, —all this made, in a considerable extent, for the development of Indian miniature-painting, for the emergence of a new style.

We have not yet become acquainted with the creations of the miniature-painter, Dust Devona, who produced the miniatures in India, though Qādī Aḥmad states that he flourished there.[21] As for Mīr Sayyid 'Alī's creations in India, the first four volumes of illustrations to the work *Qiṣṣa-i Amir Hamza*, containing a hundred miniatures in each volume, were produced under his guidance and with his participation. Therefore, it is in these miniatures that the influence of Kamāladdīn Bihzād's tradition manifests itself most strongly, especially in the colour of the ornament, daintiness of the figures and the balance of composition. While speaking about their merits, the 16th century historian, Mīr 'Aláuddoula Qazvīnī, exclaimed : "It is true that from the times that heaven emerged full of stars, nobody has ever seen such lovely pictures."[22]

The art critics are on an unanimous opinion that Kamāladdīn Bihzād's creative work raised the miniature-painting to a higher artistic level than it had done before. Further, in his creations, the old masters' achievements have been brought together to combine into a single whole. In the words of his contemporary historian, Ghiyāṣaddīn Khondamīr, Kamāladdīn Bihzād spiritualized or brightened up his images (*Jon doda*). This enables us to draw a conclusion that the great master's most valuable service in the history of miniature-painting has been his own creations to a considerable extent emotionally and artistically expressive, their having been drawn nearer to the life of his contemporaries. His personages are distinguishable, first and foremost, by such an appearance as if they were alive. It is no wonder that Aibeq, the noted academician of Uzbek SSR Academy of Sciences and a distinguished, has noted that, in Bihzad's creations, any point or any line seems to have an eye. So did the Indian painters seek to

perceive the secret of the great artist's mastery, and not without success. Thus, in his desire for special accentuation of the miniature-painters' achievements, the 16th century Indian historian, 'Atul Fadi 'Allāmī, observes that "in their pictures even inanimate objects seem animated[23]. This is surely borne out from the fact that, on having attentively any thoroughly studied Kamāladdīn Bihzād's creations, Indian miniature-painters attempted at assimilating his accomplishments.

Kamāladdīn Bihzād and his pupils were the first to illustrate manuscript works of their two great contemporaries—'Alīsher Navoī and 'Abdarraḥmān Jāmī. Their humanistic ideas, as embodied in the artistic images by miniature-painters, were to become later an inexhaustible source of inspiration and a new creative search. We know about three manuscripts by 'Alīsher Navoī and Abdarraḥmān Jāmī'a manuscript of *Bahāristān* copied in 1595 and illustrated by Indian miniature-painters[24]. 'Alisher Navoī's two manuscript copies, namely *Hamse* and *Collected Divān*, preserved, as mentioned already, in the Windsor Court Library, were also illustrated by Indian miniature-painters, created their miniatures mostly on folios remaining blank in those manuscripts. However, in some places, they dared to make partial changes in the personages' images, evidently thinking of themselves as being equal in drawing portraits, to the illustrious Herat masters.[25] In this respect, Indian painters, such as Lal, Mukund, Farruhbeg, Manohar, Janaj 'etc, were specially keen on developing the Herat masters' achievements in their creative works. In their pictures, an independent approach and an emergence of a new style manifest themselves to a much more appreciable extent than in the illustrations to *Kiṣṣa-i Amir Hamza.* We may state safely that, by the end of the 16th Century, the Indian miniature-painters had developed their peculiar style, their own manner, which differ to a substantial degree from Bihzād's style and manner.

In the creations of the famous Herat masters, even minor personages and details are thoroughly made perfect. Their miniatures seem an inaccessible ideal to painters of subsequent generations. It should be noted that, among the Indian painters, apart from Mir Sayyid 'Alī and 'Abdaṣṣamad Shīrāzī, by the level of their mastery, the names of Dasvant, Basavan, Kesu, Lal and others must be regarded as the distinguished ones. Originality of composition, delineations, refinement and daintiness of a pictorial representation and an elegant finish are inherent in their creations. Besides, their creations particularly retain that distinctive feature of miniatures of the Herat masters which is known as the multifariousness of a composition, or the narrativeness, by art critics. For this reason, in the pictures drawn by Indian Painters, their individual observations reflecting life of their epoch and conditions of their people's life are strongly pronounced. Their miniatures abound so much in details of everyday life, in their authenticity, that sometimes they seem to be genre pictures. It is these features that are typical of most of the miniatures in *Bāburnāme*, *Yoga Vaśiṣṭha*, and others, which were produced at the end of the 16th century.

Kamāladdīn Bihzād and his school have the distinctive credit of having developed the portrait-painting. Experts are of the opinion that, in the portraits drawn by Bihzād, one can see vivid individual peculiarities of the personages represented and their nature. Portrait-painting was so much developed by Indian painters that they had no equals indeed in this field. A special album was created by them consisting of portraits of public officials, in consequence of which, according to Abul Fadı 'Allāmı's figurative description, "those who were dead acquired new life, and those who were still alive were ensured immortality."[26] Among the Indian miniature-painters who had greatly succeeded in the mastery of portraiture, there were such names as Vishnu Das, Manohar, 'Abdúl Hasan, etc. It is noteworthy that 'Abdarraḥmān Jāmī's portrait which was drawn by Bihzād, has only come down to us through a copy of the great master's creation made by the Indian painter. Davlat Khānazād.[27]

As a master endowed with real creative power, Kamāladdın Bıhzād did not develop artistic achievements of his predecessors alone, but worked incessantly towards perfection of his own creative talents. Thus, if we compare his own creations, it is not difficult to see some of the images created by him passing from one picture to another, while they are being simultaneously perfected. In this connection, suffice it to mention, for example, the building scenes in the manuscripts of *Ẓafar-nāme* and Niẓāmı's *Hamse* or the scenes representing Madjnūn in a desert. This incessant creative search from one miniature to another, reiteration of common composition decisions and, sometimes of the postures of personages and figures can be traced as well in Indian miniatures to historical chronicles, such as Hashidaddin's *Djāmi at-tawārikh*, *Tārikh-i Khānadān-i timūriya*, Abúl Faḍl Ȧllāmī's *Akbar nāme*. etc.

Kamalāddīn Bihzād is a universally recognized master of enchanting drawings and colour. However, the creations of his Indian followers seem to have lost the facinating harmony of colours that was inherent in the great master's miniatures. Moreover, despite the achievements of Indian masters in the art of drawing, the fineness and daintiness of their lines notwithstanding, the expressiveness, or the lyric of Bihzād's drawing, which distinguish his creations from those of others, seem to have been lost in the creations of Indian masters.

Though there is evidence of the creative influence of the achievements of Kamāladdın Bihzād and his pupils on the Indian miniature-painters, it is necessary to stress the fact that, the paintings of European masters were bolder in the use of those features that were absent in the creations of the famous Herat masters. This was accomplished by the partial application of the laws of lineal and air-view in representing the landscapes of the horizon as well as architecture and, sometimes, a three-dimensional image of objects and relief of the country in their miniatures.

The best creations of the 16th century prominent Indian miniature-painters, imbibing creative achievements of the former masters, have made a valuable contribution to the treasury of world art, for they are "worthy of Bihzād's brush and may be placed in line with remarkable pictures of the universally renowned European masters."[28]

This is just and high appreciation of the creative success of Indian miniature-painters; that is why today their creations, reflecting artistic genius of the Indian people, have taken their due place in the world collections of works of art.

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INDIAN ILLUMINATED MANUSCRIPTS IN THE COLLECTIONS OF THE TAJIK SSR ACADEMY OF SCIENCES : THEIR TRADITIONS AND ADOPTIONS

L. DODKHUDOEVA

The theme of interconnections between Central Asia and Indian cultures, which is still badly studied, but which is actually boundless, is being worked out lately in several aspects. Among them, the typology of illumination of manuscripts remains almost problematic. In fact, its takling is inseparably linked with the publication of patterns of ornamentation of manuscripts from various collections, among which the collection of the oriental manucripts of the Academy of Sciences of Tajik SSR is practically unknown even to the specialists. Meanwhile, a large number of manuscripts which can serve as valuable cultural and historical documents for a study of this problem are preserved in this collection.

The impact of Iranian and Central Asian cultures on certain aspects of aesthetics and art of India is well borne art as a result of contemporary investigations. In its art and technique of writing and presentation mediaeval India had adopted from these countries not only the method of book production, but the whole image-bearing system of its illumination, including calligraphy, ornamentation and miniatures.

Illumination of mauscripts in Islamic India consisted of rosette (*shamsa*) which was used in different cases as a blessing and as a title-page further, there are enchanting illumination of the whole page (*sarloh*), that of the upper part of the page; (unwan) and ornamented head-pieces at the begining of chapters, illumination of the margins and colophons (*hatima*).[1]

Configuration of *sarlohs* and *unwans* are regarded as being influenced by architectural forms (rectangular facades and the pointed cupolas of mosques, elements of architectural decor, mosaic surfaces of the portals of the buildings or carpet ornamentation).[2]

This endeavour variety reflects the uniting significance of the mediaeval style and illumination in particular, which was, as R. Ettinghausen puts it, "a kind of mother art', in which were evolved principles used in other media".[3]

Numerous examples from the history of oriental art, as well as that of other regions, reveal that decorative design of manuscripts had always been inseparably linked with the evolution of architecture, painting and ceramics.[4] Consequently it is necessary to study the typological fundamentals of the book illumination in relation to the peculiarities of the style of other fine arts.

Indian and Central Asian manuscripts had clear illumination principles, and the form of *sarlohs, unwans* and other ornamental decorations of the book acquired stable and unified forms.

Sarlohs and *unwan* that marked the commencement of the text in a manuscript, are often called the portal of the book, its front door which introduced the reader into the contents of a literary source.[5]

This definition acquires a special significance, if we compare the configuration of " ⊓ " shape aivan, which served as a main portal of muslim buildings.

In its compositional structure, *sarloh* resembles the plan of a mosque, because its location on the pages of a manuscript in the shape of an ornamental rectangular framing of the text is extremely close to the foundations of a Islamic buildings, which represented a rectangular yard surrounded by galleries.

As for *unwan*, it is more in line with the arched portal of the building's facade and its outlines, because mostly it was rectangular with a scalloped arch or arcade entering into it and resting on cartouche with *bismillāh.*

But, at the same time, there still exists another variation of *unwan*—a frieze, resembling a decorative panel, which together with the medallion and the arch, belonged to the traditional types of the ornamental framing in respect of all the arts.[6]

The link between the head-pieces in the book and architectural forms is characteristic not only of oriental manuscripts but also those of other regions. Thus, in Armenian gospels, the image of the *horans* was worked out by the motifs of the triumphal arch and columned portico. And the manuscripts in ancient Russia were decorated by so-called architectual frontis-pieces.

The builders and painters of the mediaeval East soon disclosed the dynamic possibilities of the arch whose shape combines the structural and decorative properties, and hence the arch becomes one of the basic elements of all the Islamic fine arts—from textiles to tombstones.[7]

Even the Arabic name for the arcade—*rawq*—has become synonymous with the words beautiful, graceful or pure.[8] It is worth recollecting that the earliest indicator of *Ka'aba* on the coins of Umayyad Caliph Ābd-al Malik (685-705 A.D.) was the spearline object shown standing upright within niche, which by this time had become normative as the liturgical indicator of the Muslim holy place.[9] *Mihyāb*, the altar niche, in its graphic expression, has the outlines of an arch in a rectangular frame of the walls. Its vault corresponds to the Heaven, and its piedroit to the Earth. Its shape makes the niche an image of the "cave of the world", "a place of appearance of the Divinity.".[10] Consequently, apart from the tradi-

tional *bismillāh* formula, which was an indistinguishable part of *unwans* and *sarlohs* the similarity of their graphic contour with the configuration of the liturgical indicator of the main "Muslim holy place" and with the scheme of cult construction, imparted to them the sacral function which permitted the further depiction both verbally and pictorially.[11] *Bismillāh* has become an accessory of the initial elements of the ornamental decoration of the manuscripts. These elements are very similar in their outlines to those architectural elements—portals and cornices--into which *bismillāh* was often inserted together with other epigraphic inserts.[12]

The arch or arcade design used already in the title of *suras* in the early manuscripts of *Koran*[13] found a varied realisation not merely in manuscripts but even otherwise.

This universal construction is expressively used specially in the outstanding monument of Mughal architecture, the Taj Mahal in Agra (1624—54 A.D.) where an arch within a rectangular form becomes the modulus of the entire architectural complex and its decor.[14] This motif is also used in the magnificent portal repeated by small and big arched apertures on all the floors of the building, including doors and windows. It is also reiterated many times in the cut-top parts of the niches (*muqarnas*). The platform itself, on which building is errected, is decorated by the arcade, streching along its perimetes. This decorative leit-motiv is strengthned by the decorative epigraphic panels on the building.

Sometimes, the arch has been used in an usual way. Thus, in the 'Ali-qapu's palace in Isfahān, the niches with the arched apertures extend here into the ceiling and form the cupola.

Hence, a simple architectural form—arch—was, in the Middle Ages, an universal construction and was used functionally in different types of buildings.[15] And its graphical expression in the illumination of manuscripts also found a varied realisation.

If we turn to the decoration typology of the rug used in Muslim prayer, we also see how important has been this decorative motif. As a rule, on one of the rug's narrow sides, there was an ornamental design of a special configuration, which imitated the *mihrāb* niche. During prayer this side of the rug was usually turned towards the direction of *Kaåba*. The given sign, *qibla*, had the shape of an arch inserted into the rectangular space of the rug. If compared, the similarity between the composition of the prayer rug and the scheme of location of *unwans* and *sarlohs* on the pages of manuscripts is clearly seen.[16] The *sarlohs* in the fifteenth century manuscripts, like prayer rugs, were vertically divided into three parts: cartouches at the top, the bottom and the central part. Later, the central part was also divided into three parts: two narrow cartouches on the left and right, and in the middle where the text was placed,[17] i.e. their design became more like the scheme of a mosque, but at the same time preserving the typological fundamentals

of the prayer rug. As for the general composition of the pages or a manuscript with *unwan,* it was much the same as the unified traditional motif of the arch in the rectangular frame, which was used in the design of the prayer rug. However one should bear in mind that the real working space of the manuscript was the double-page space, and the ornamentation strictly corresponded to its form and tectonics.

Thus the main principles of surface decoration, be it a wall, a page or a rug, were similar, and the ornamentation served as a kind of cover for them, interalia spreading over them the conver, concave or flat forms.[18]

Nevertheless, the number of decorative devices used in Iranian, Central Asian and Indian manuscripts was rather limited; they were mostly palmette, rosette. two-petals bud, trefoil, pointed leaf, cloud-bands resembling a decorative ribbon, peony, lotus and a few others. But the variations of their combination are so multiple, and the functional character or lines, each of which served not only for the delineation of space division, but also the decoration itself was so significant that all these favoured the diversity of manuscript illumination.

At the same time. *unwan's* ornamental complex composition was an aesthetic symbol of an enchanting garden with mystic motifs.[19] Palmettes were perceived as flower—decorated leaves that some how have the faculty of resembling the shell of mother of pearl; the cloud-bands, as floatting ribbons of silk; the tendrils as webbing of frost; the lancet leaves as plumed frond; and the arabesque as vines. Thus the ornamental surface of *unwans* and *sarlohs* served not only as a manuscript decoration but they even aroused in the reader a good deal of association and ideas.

Common typological fundamentals of manuscript illumination of India and Central Asia do not mean a full identification of their decorative ornamentation. These basic principles never bound the masters, but gave much space for their creative imagination helping to preserve the peculiar features which became characteristic of those countries. That is why, in Indian, Iranian and Central Asian manuscripts, similar elements could be found differently presented. There is an opinion that Indian craftsmen had adopted Iranian and Central Asian combination of the blue and gold colours. But while the blue colour was used for the background in Iranian and Central Asian manuscripts, the gold background was normative for Indian manuscripts,

Jāmī's *Tuḥfat-al-akhrār* (1576) and *Haft avrang* (1587) and other manuscripts from the collections of the Tadjik Academy of Sciences can be regarded as examples of the Mughal school of painting, because the *unwans* in these manuscripts have the design of tendrils with round buds and pointed leaves.

The decorative spiral tendril resembles, by its outlines, the design *islimi*, which was greatly favoured by Iranian and Central Asian painters and which undoubtedly was its prototype.

The columns of the text in such manuscripts were often separated by wide frames, in which a tendril with buds was inserted, resembling a briaid ornament (*Gazaliyāt; Sh'fā-i*) or *zindjira* edging in *Ḥafiz's Dīvān* (1683) which was also very popular in the illumination of Central Asian manuscripts.

In a peculiar was, the features of Central Asian and Indian painting schools co-exist in Niẓāmī's *Hamse*, copied by the scribe, Muḥammad Sáid al-kātib, in 1651 (n 11 03).

Very close to the samples of the Mughal school of the seventeenth century, are seven tiny miniatures. In them dominate the profile portraits, Indian costumes, white marble architecture, and sometimes *tilaka* is placed on the heroine's forehead.

Sarloh and *unwan* are specially characteristic of Central Asian manuscripts of the seventeenth century. The last *unwan* in the manuscript, as well as flower bouquets on the margins of the pages, and the text of the last poem. *Iskandar-nāme* were accomplished a century later in Central Asia. It is highly probable that the miniatures were created by an Indian painter in full compliance with the iconography of Nizami's subjects in Iranian and Central Asian painting. Such a cooperation was quite common in the seventeenth and eighteenth centuries.[20]

Sometimes, the text of one and the same literary composition was differently interpreted by Indian and Central Asian painters. For instance, the peculiarities of the illustrations of the manuscript *Ikhtiyarāt-i badi'*-i of 'Alī ibn al-Hasan al-Anṣārī (Hājjī Zain al-Aṭṭār) from the collection of the Tadjik Academy of Sciences (n 1930), which was copied for the great Mughal Aḥmad S͟hāh, in 11 70 A.H./1756 A.D., by the scribe, Ḥāfiz Abd ar-Razaq Muḥammad Kaim, lie in the unusual interpretation of the text, which consists of a list of Arabic names of herbs and of some information about medicines. The painter who illustrated the manuscript did not draw the plants mentioned in the phrmacopeia, as was normally done in Central Asia.[21] He illustrated the text with miniatures showing patients examined by the doctor, a *ṭabib* with cures surrounded by his apprentices, collecting the herbs, and the like (Fig. 1). Dim whitish colour of miniatures and somewhat stiff figures point out the provincial school style of the mid-eighteenth century.

The peculiarities of Kas͟hmīr manuscripts of eighteenth-nineteenth centuries are mainly determined by Persian-Tajik poetry, calligraphy and painting. Nine manuscripts from Kas͟hmīr which are kept in collection of the Tadjik Academy of Sciences[22] widen, in many respects, the knowledge about Kas͟hmīr painting. More so because there are such manuscripts that are never met in other collections and



Fig. 1. The patient examined by the doctor "Ihtiyarat-i badi-i" Ali b. al-Hasan al-Ansary (n 1930, fol. 93)

they testify to the special features of Kas̱ẖmīr painting which are yet insuficiently studied. Rūmī's *Masnavī* are presented by three manuscripts (Fig. 2) which proves that this work was popular in Kashmir no less than the works of Niẓāmī, Jāmī, Khusraw Dehlevī. Besides, four other manuscripts have exact dates when the texts had been copied, and this enables to judge the development of painting style of the North Indian school in a more definitive manner.

Frontispieces and *unwans* in Kas̱ẖmīr manuscripts had a shape similar to that of the usual decoration of manuscripts in the entire Near and Middle East. Yet, even among them, one can come across rather uncommon elements of manuscript decoration. The *unwans*, from *Rūmī's Masnavi*, (1593 n 1865), are an example. They were added to the manuscript in the second half of the eighteenth century.

The *unwans* are quite different from the traditional types of head-pieces, although they are framed by a garland of violet lotuses and in the centre is an emerlad-ruby inset common among the North Indian works. The pictures in *unwans* look like dark blue heaven with numerous coloured dots as stars. They are formed by two blue and one central golden semi-circular scallop. The scallops are placed

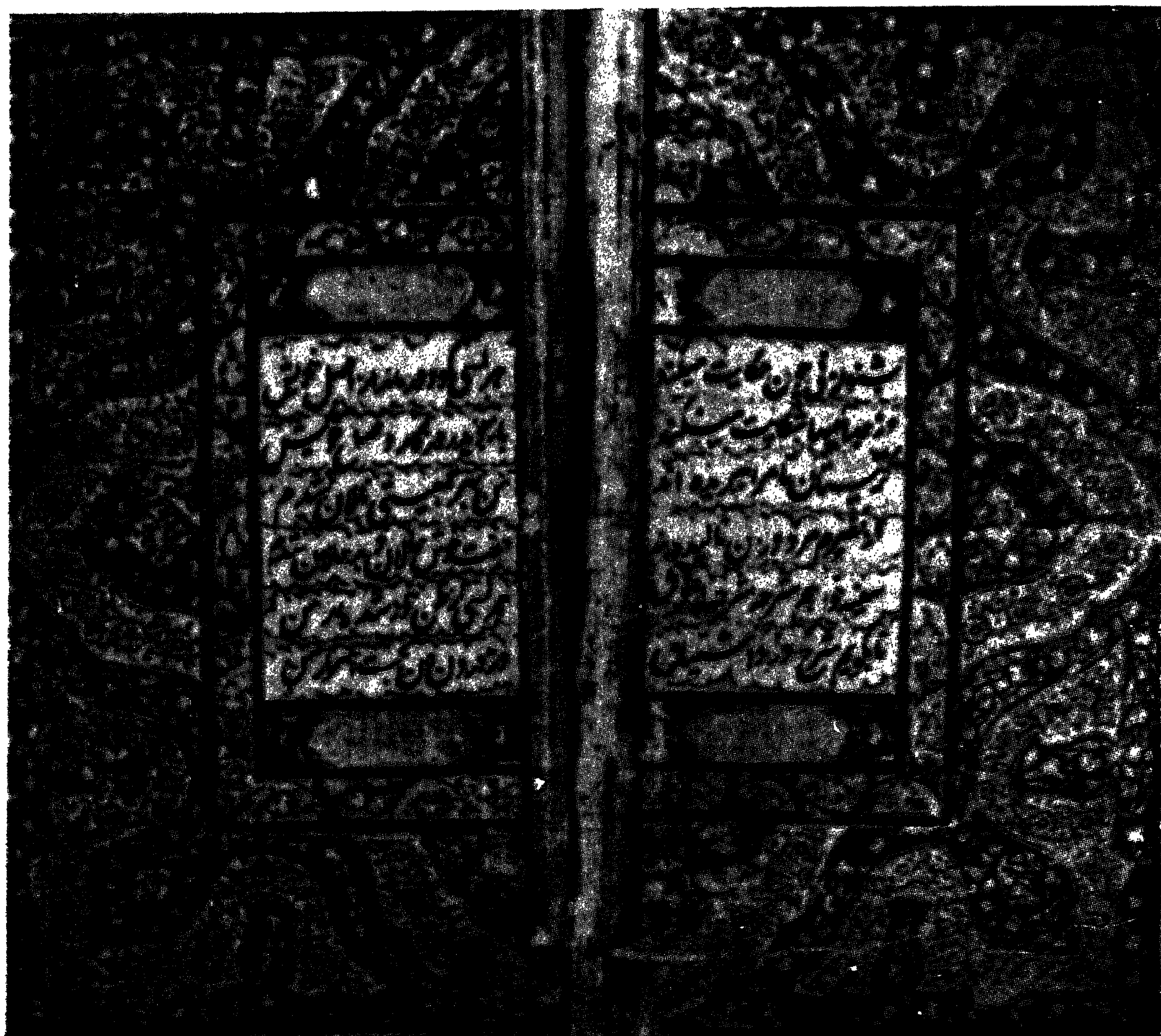


Fig. 2. Sarloh of the manuscript "Masnavi" Rumi 1820-22. (n 198, fol. 1b-2a)

one about the other, and each is filled with spiral tendrils. The golden scallop is decorated with violet, yellow and red flowers, and the two blue scallops, mostly with white buds, whose picturesque combination is really suggestive of heaven and starts.

The miniatures of two other manuscripts are based on the popular plots of Persian-Tadjik poetry, one of the most characteristic features of North school. Jāmī's *Yūsuf Wa Zulekha* (n 466) is decorated with one *Unwan* and twelve miniatures. In his interpretation of the plots, the Kashmir painter followed the established pictorial tradition; that is why, among the illustrations of this manuscript, there are many analogies with the Iranian and Central Asian miniatures.

The illustration "Sale of Usuf to Slavery", is characterised by a rare ingenuity in the treatment of the plot, where the popular pictorial subject is interpreted quite forthrightly (Fig. 3).



Fig. 3. Sale of Usuf to Slavery. "Usuf va Zuleiha." Jami. (n 466, fol. 65)

The hero is placed on one scale, and gold as well as jewels that should be given to the old woman sent by Zulekha for the beautiful slave, on the other. A good deal of illustrations of this manuscripts are notable for the desire to represent the action very clearly. But it is very likely that there are no analogies with this miniature either in the Iranian or in the Central Asian painting.

The miniatures of Nizāmī's *Khusraw was Shirin*, 1244 A.H./1829 A.D. (n.

753), created by two painters, are also very traditional analogous to those preserved in the collection of Saltikov-Schedrin State Public Library in Leningrad.[23]

The miniature *Khusraw sees Shirīn at the Brook*, is based on the ancient tradition of portraying the subject, which had been followed by Iranian and Central Asian painters for countries. But its iconography had changed during the second half of the seventeenth century, and this change found its reflection not only in Iranian and Central Asian painting but, most probably, in Kashmir painting too. During the second half of the seventeenth century, Shirin was no longer pictured bathing in the pond, as it had been traditionally done, but sitting on the bank. Iranian and Central Asian miniatures of the later period are characterized by a conglomeration of minor details which served not only so much for the representation of the subject but also for the complication of the picture. Shīrnī's traditional loin-cloth was subsituted by a long wide skirt, its thin fabric showing the outlines of her body.

In the Kashmir miniatures, after change in the treatment of this subject in Iranian and Central Asian painting the seventeenth century, the heroine was pictured as sitting on a stone near a pond. She is decorated with numerous jewels, a decoration unseen in the Iranian and Central Asian illustrations of fourteenth-sixteenth centuries.

Another miniature *Farhād and Shīrīn on the Bisutūn Mount*, also bears the signs of "modern" interpretation, which manifested itself in Iranian and Central Asian painting in the middle of the sixteenth century and became common in later samples. This refers first of all to the image of the shephered milking the goats, and the milk stream flowing to Shirin's place.

The Indian illuminated manuscripts from the collection of the Tadjik SSR Academy of Sciences are facial richly decorated manuscripts in which everything, from binding to head-pieces, is done in the traditions of this school. Very closely connected with the literary works of Iran and Central Asia of the period, they possess piculiar Indian features, which make it possible to distinguish them as an individual school of Oriental miniature painting.

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THE JĀMIĀL-TAWĀRĪKH MANUSCRIPT IN THE ASIATIC SOCIETY, CALCUTTA

Asok Kumar Das

The Asiatic Society, Calcutta is the proud owner of a key document of Islamic art symbolising the blending and synthesization of more than one cultural and artistic strain prevailing in the Middle East and Central Asia in the fourteenth century. The document is in the form a fragmentary manuscript of Rashīd al-Dīn's *Jāmi' al-Tāwārīkh*—"Compendium of Histories", or as popularly known, the World History.

The manuscript (MS) assumes added importance as another MS of the same work belonging to the Royal Asiatic Society of Great Britain and Ireland was put on sale at the Sotheby's London saleroom on 8th July, 1980 where it realised an all time record saleroom price of £ 850,000 paid for an Oriental manuscript. Much to everyone's relief, this extremely rare and important MS was acquired by the British Library where it was deposited by the Royal Asiatic Society for safe custody for many years.

The Calcutta MS is not as well-known as the London copy, supplemented by the earlier part of the same work preserved in the Edinburgh University Library. The Royal Asiatic Society obtained this MS in 1841 when it was bequathed to it by Major General Thomas Gordon. The Society, like most other academic bodies depending on public subscriptions and grants every where, including our own Asiatic Societies in Calcutta and Bombay was passing through acute financial crisis, and the council of the Society took the drastic decision with 'utmost reluctance' to dispose of the MS, universally recognised for its rarity and art-historical importance, to realise a substantial capital sum that would add to its financial security. Happily enough the Asiatic Society, Calcutta did not have to plan in that line, though its financial problems are equally distressing :

The Edinburgh copy completed in 1306 and the London copy completed in 1314 are contemporary works, predating the undated Calcutta MS. These MSS are the sole survivors of the considerable body of manuscripts of historical works written by Amīr Rashīd al-Dīn Fadl-allāh, the talented author and administrator of the Il-Khanid rulers of Persia and copied and illustrated under his personal supervision in his own scriptorium at Rashīdiya, (*Rab'-i-Rashīdī*) on the outskirt of Tabriz in north-western Persia.

The Il-Khan Mongols ruled Persia from 1251 to 1335 during which close cultural links with Central Asia and China (of the Sung and Yuan period) were established. Though the Mongol hordes of Changhīz Khān overran the northern

part of Iran in 1220-21 it was his successor Ogodai who conquered the whole of Iran followed by Hulagu's conquest of the Abbasid capital Baghdad. When the Mongol territories were divided, Hulagu got Georgia, Armenia, Azerbaijan. Iran, Khorasan and part of Asia Minor and started his rule in 1256 after assuming the title Il-Khān.

The Il-Khans were Buddhists until Aḥmad Tagudār (1282-1284) and Maḥmūd Ghazān Khān (1295-1304) were converted to Islam. Initially they were tolerant to different religions and cultures, and different countries bringing heterogenous cultural elements in their productions. Maḥmūd Ghazān Khān was a great builder and a lavish patron of art and literature.

Rashīd al-Dīn, son of Abū's Khaīr Àlī, was born in 1247. He started his career as a *Ṭabib* or physician for the Il-Khanid ruler Abaga (1265-1282). He made his mark as an official and during the reign of Maḥmūd Ghazān Khān he was appointed deputy to the Vizier and then a court historian. As the eminent British scholar E.G. Browne has stated in his monumental *Literary History of Persia*, Ghazān Khān realised that the Mongols, despite their temporary supremacy, would inevitably be absorbed by the Persians in course of time. He therefore wanted to leave for posterity a testimonial of their fame in the form of a faithful record of their history and conquests, and entrusted Rashīd al-Dīn with the task of writing the History of the Mongols. He could not have made a better choice. After its completion Ghazan's brother and successor, Uljaytu (1304-1317), whom he served as a theologian, commissioned Rashīd al-Dīn to write a history of world. When two parts of this work was completed and work for the third part was in porgress Uljaytu died and Rashīd-al-Dīn was persecuted by enemies in the court. Ultimately, he was deposed in October, 1317 and, by the intrigues of his political adversaries, the seventy-one year old statesman-historian was accused of poisoning his patron Uljayatu and excuted.

The Il-Khanid dynasty ended with Abū Sai'd (1317-36), who was also a good patron of the arts. According to the sixteenth century Persian court painter, Dust Muḥammad, Master painter Aḥmad Mūsa practised the kind of painting style from which the true persian style of miniature painting originated. Scholars generally regard the "Demotte" *Shāhnāma* as the work of this period, which shows substantial development from the Edinburgh and *Jāmī 'al-Tawārikh*—with more complex compositions, brighter palette and flexible and subtle line-work.

He enjoyed the confidence of Uljaytu with whose generosity he built a lovely suburb named Rashīdiya on the hillside to the east of Tabrīz. It is said to have contained almost one thousand houses, an imposing mosque, schools, a university and an well-equipped scriptorium, a centre where scholars of many subjects—mathematics, astronomy, history, theology and medicine—participated in

various intellectual projects and wrote works for the enlightened Sultan and his learned Vizier.

Scribes, painters and illuminators were also employed by Ras̱hīd al-Dīn who had full access to the Sultān's personal library. According to the literary historian Daulat S̱hāh, the learned prime minister was so burdened with the affairs of the state that he could only devote the short time between his morning prayers and sunrise to his literary pursuits. The *Jāmi' al-Tawārīḵẖ* is remarkable for its insistence on first hand sources, or at least native information and for unbiased university of its historical approach.

Ras̱hīd al-Dīn, in fact, chronicled the tradition of each nation as recorded by its people in a simple and readable style, devoid of flowery language or eulogistic expression. The first section on the history of the Mongols in three parts was completed and presented to Uljaytu in 1306. The second part comprising a short history of Islam and accounts of India. China and the Jews was completed and presented to the Sultan in 1314. The proposed third section with geographical and tepographical data on the countries could not be completed as the scriptorium was ruthlessly plundered in 1317/18 after Ras̱hīd al-Dīn's downfall and execution. The learned author took pains to safeguard the future of his works by preparing copies in Arabic and Persian and sending them to important libraries of various centres. In spite of this, very few manuscripts of the *Rashidiya Scriptorium* have survived.

In the 63—leaf London copy, the Arabic text is divided into four sections; history of Muhammad (folios 2-6), history by China (folios 9-18), history of India (folios 1941) and history of the Jews (folios 42-60). It is illustrated with one hundred miniatures in the form of horizontal panels. The style of the miniatures may be described as a synthesis of the Chinese, Mongol and Byzantine traditions with elements of Sassanian, Mesopotamian and even Buddhist schools of Afghanistan and Central Asia. Along with the illustrations of a Bestiary manuscript of Ibn Baḵẖtis̱hu *Munāfi' al-Hayawān* prepared at Maragha in 1298, now in the Pierpoint Morgan Library, New York, and the seventy miniature of the Edinburgh University Library copy of the opening part of the *Jāmi'al-Tawārīḵẖ,* these miniatures represent the first flowering of the Persian painting style. Any serious study of Persian painting must proceed from this well-established starting point. The importance of the manuscripts, therefore, beyond any controversy.

The cosmopolitan character of the style is symptomatic of the universal nature of the work and the cosmopolitan outlook of the Il-Ḵẖānid rulars. Ras̱hīd al-Dīn's first patron Abaga had a Christian wife named Maria Palaeologos. Although his successor Aḥmad Tagudar was a Muslim the next Il-Ḵẖān Arghaun (1284-1291) was a Buddhist, which paved the way for artistic influences from Afghanistan, India Central Asia and China. Il-Ḵẖān Maḥmūd G̱hāzan Ḵẖān

officially made Islam his state religion but at the same time encouraged foreign scholars from far and near places to settle in Tabrīz. In fact, Tabrīz was at this time one of the great metropoles of Asia, a merchants and travellers from China, India, Armenia, Italy and Arabia thronged its confines. Rashīd al-Dīn took the help of Chinese, Indians as also Christian scholars, and painters from Mesopotemia and Syria at the time of compilation of his World History.

'The style of painting that emerged from this active crucible', writes the eminent art historian B.W. Robinson, 'is quite unlike any other, strongly drawn, restrained in colour austers and melancholy in feeling, it is in striking contrast to its comparatively primitive predecessors of the Baghdad school on the one hand, and the courtly elegence of the succeeding Jalayrid style on the other. It marks the actual moment of fusion of earlier Islamic and Persian traditions with Byzatine, Indian, and above all Chinese elements, before they had time to merge smoothly into a coherent style'. The trees and hills are strongly Chinese drawn with forceful calligraphic lines and delicate colouring. The influence of the Jacobite Christian Schools of Syria and Mesopotamia is also clearly apparant in some of the miniatures. The paintings are realistic, full of movement, and often expressive of violent sentiments. Contemporary events have been documented with great accuracy, though the earlier accounts often back historical veracity.

Long after the destruction of the Rashīdiya scriptorium, the Tīmīrid Sulṭān of Persia Shāh Rukh (1405-1447) retrieved the surviving copies in the second half of the fifteenth century. The Royan Asiatic Society copy bears the impression of his seal, which reads; *'min Kutub-i-Khizānat al-sultān al-Ā'zam Shāh Rukh Bahādur*: Rashīd al-Dīn's text was accepted as a key work and numerous copies were prepared in Persian, Turkey and India in subsequent years. A profusely illustrated copy was prepared for Emperor Akbar in 1596, the bulk of which is preserved in the Gulistan Palace Library, Teheran.

The London copy of the work surfaced in the beginning of the nineteenth century in Eastern India, when it was collected by an employees of the East India Company, John Stamples Harriot, whose inscription 'John Stamples Harriot-Danapur-1113' is to be found on folio iv. Harriot joined the East India Company in 1797 and became a colonel of the Bengal Infantry. After losing a leg during the Battle of Delhi in 1803 he served as an interpreter to the Courts Martial at Chunar and Danapur in Bihar. He returned to England in 1838. The manuscript was subsequently acquired by the famous historian and champian of Greek independence Maj. General Thomas Gordon, who bequeathed it to the Royal Asiatic Society in 1814. Since the Edinburgh University Library copy of the *jāmi' al-Tawārikh* was collected from Lucknow at about the same time by Colonel John Baillie, both these works seem to have come from the dispersed library of the Nawābs of Oudh. As neither of these contain any Mughal seal or inscribed notes,

various intellectual projects and wrote works for the enlightened Sultan and his learned Vizier.

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Rashīd al-Dīn, in fact, chronicled the tradition of each nation as recorded by its people in a simple and readable style, devoid of flowery language or eulogistic expression. The first section on the history of the Mongols in three parts was completed and presented to Uljaytu in 1306. The second part comprising a short history of Islam and accounts of India. China and the Jews was completed and presented to the Sultan in 1314. The proposed third section with geographical and tepographical data on the countries could not be completed as the scriptorium was ruthlessly plundered in 1317/18 after Rashīd al-Dīn's downfall and execution. The learned author took pains to safeguard the future of his works by preparing copies in Arabic and Persian and sending them to important libraries of various centres. In spite of this, very few manuscripts of the *Rashidiya Scriptorium* have survived.

In the 63—leaf London copy, the Arabic text is divided into four sections; history of Muhammad (folios 2-6), history by China (folios 9-18), history of India (folios 1941) and history of the Jews (folios 42-60). It is illustrated with one hundred miniatures in the form of horizontal panels. The style of the miniatures may be described as a synthesis of the Chinese, Mongol and Byzantine traditions with elements of Sassanian, Mesopotamian and even Buddhist schools of Afghanistan and Central Asia. Along with the illustrations of a Bestiary manuscript of Ibn Bakhtishu *Munāfi' al-Hayawān* prepared at Maragha in 1298, now in the Pierpoint Morgan Library, New York, and the seventy miniature of the Edinburgh University Library copy of the opening part of the *Jāmi'al-Tawārikh,* these miniatures represent the first flowering of the Persian painting style. Any serious study of Persian painting must proceed from this well-established starting point. The importance of the manuscripts, therefore, beyond any controversy.

The cosmopolitan character of the style is symptomatic of the universal nature of the work and the cosmopolitan outlook of the Il-Khānid rulars. Rashīd al-Dīn's first patron Abaga had a Christian wife named Maria Palaeologos. Although his successor Aḥmad Tagudar was a Muslim the next Il-Khān Arghaun (1284-1291) was a Buddhist, which paved the way for artistic influences from Afghanistan, India Central Asia and China. Il-Khān Maḥmūd Ghāzan Khān

officially made Islam his state religion but at the same time encouraged foreign scholars from far and near places to settle in Tabrız. In fact, Tabrız was at this time one of the great metropoles of Asia, a merchants and travellers from China, India, Armenia, Italy and Arabia thronged its confines. Ra<u>sh</u>īd al-Dīn took the help of Chinese, Indians as also Christian scholars, and painters from Mesopotemia and Syria at the time of compilation of his World History.

'The style of painting that emerged from this active crucible', writes the eminent art historian B.W. Robinson, 'is quite unlike any other, strongly drawn, restrained in colour austers and melancholy in feeling, it is in striking contrast to its comparatively primitive predecessors of the Baghdad school on the one hand, and the courtly elegence of the succeeding Jalayrid style on the other. It marks the actual moment of fusion of earlier Islamic and Persian traditions with Byzatine, Indian, and above all Chinese elements, before they had time to merge smoothly into a coherent style'. The trees and hills are strongly Chinese drawn with forceful calligraphic lines and delicate colouring. The influence of the Jacobite Christian Schools of Syria and Mesopotamia is also clearly apparant in some of the miniatures. The paintings are realistic, full of movement, and often expressive of violent sentiments. Contemporary events have been documented with great accuracy, though the earlier accounts often back historical veracity.

Long after the destruction of the Ra<u>sh</u>ıdiya scriptorium, the Tımīrid Sulṭān of Persia <u>Sh</u>āh Ru<u>kh</u> (1405-1447) retrieved the surviving copies in the second half of the fifteenth century. The Royan Asiatic Society copy bears the impression of his seal, which reads; *'min Kutub-i-<u>Kh</u>izānat al-sultān al-Ā'zam <u>Sh</u>āh Ru<u>kh</u> Bahādur*: Ra<u>sh</u>īd al-Dın's text was accepted as a key work and numerous copies were prepared in Persian, Turkey and India in subsequent years. A profusely illustrated copy was prepared for Emperor Akbar in 1596, the bulk of which is preserved in the Gulistan Palace Library, Teheran.

The London copy of the work surfaced in the beginning of the nineteenth century in Eastern India, when it was collected by an employees of the East India Company, John Stamples Harriot, whose inscription 'John Stamples Harriot-Danapur-1113' is to be found on folio iv. Harriot joined the East India Company in 1797 and became a colonel of the Bengal Infantry. After losing a leg during the Battle of Delhi in 1803 he served as an interpreter to the Courts Martial at Chunar and Danapur in Bihar. He returned to England in 1838. The manuscript was subsequently acquired by the famous historian and champian of Greek independence Maj. General Thomas Gordon, who bequeathed it to the Royal Asiatic Society in 1814. Since the Edinburgh University Library copy of the *jāmi' al-Tawāri<u>kh</u>* was collected from Lucknow at about the same time by Colonel John Baillie, both these works seem to have come from the dispersed library of the Nawābs of Oudh. As neither of these contain any Mughal seal or inscribed notes,

they appear to have reached India only in the 18th century after the virtual liquidation of the Mughal dynasty.

The Calcutta copy of the *Jāmi'-al-Tawārikh* is not a product of the *Rab'-i-Rashidi* scriptorium, but from the large size (47 × 32.5 cm) of its 122 folios, it seems fairly close in point of time to the Rashīdiya original. It has 21 miniatures. several of which are almost the size of the whole page. The text is written rather carelessly in the nastalig script. The paper is thin and the folios disarranged. It deals with the period covering A.H. 617 (1220-21 A.D.) to A.H. 698 (1298-99 A.D.) The Asiatic Society got the copy from the library of Fort William College and mentioned for the first time by Mīrzā Ashraf 'Alī in his *Catalogue of Manuscripts* published in 1890 (no. D. 31, p. 19) It was subsequently examined by Basil Gray in 1947 and partly published in the *Ars Orientalis*, I, 1954, pp. 65-75.

The importance of this MS lies in the uniquencess of the style of its 21 miniatures. The strong Chinese character of the miniatures of the Edinburgh and London MSS, with their pure linear style, restrained colouring and malancholy feeling is not present in them. Yet they differ from the courtly elegance of the succeeding Jalayrid and early Tīmūrid style. Gray has grouped this MS with the *'Ajā' ab al-Makhlūgāt* (sup-pers. 332) of 1388 in the Bibliotheque Nationale, Paris and the dispersed MS sup. pers. 1113 in the Bibliotheque Nationale, Paris, which is an early Tīmūrid work. Yet the style is not similar to that of the provincial Inju or Muzaffarid styles.

The miniatures of this MS are:

1. *Folio 84 recto* : The inhabitants of Balkh leaving the city. February 1221 Changhez Khān crossed the Amu Darya and invaded Balkh. Though the citizens were taken out for enumeration, in fact they were all slaughtered by the Mongols.

2. *Folio 85 recto* : Battle between the armies of Changhez and Jalāl al-Dīn Mingburnī. This fight took place in November 1221, on the banks of the Indus. The latter was defeated.

3. *Folio 86 recto* : Jalāl al-Dīn escapes by swimming his horse across the Indus. Jalāl al-Dīn is shown on the other side of the mighty Indus, drying his sword while the fully armoured Mongol army helplessly watch.

4. *Folio 86 verso* : Changhez order the massacre of all the male children of Jalāl al-Dīn.

5. *Folio 87 verso* : Changhez orders a "quriltay" on the shores of the Banakath or Angrel river, a tributory of the Sir Darya, in the director of Ilaq or Tashkent.

6. *Folio 89 recto* : Changhez hosting a great feast in a great tent in his tribal homeland in 1224 or 1225.

7. *Folio 90 ricto* : Changhez K͟hān's last word of advice to his favourite sons Ogodai (Ogotay) and Tului, while the rest of the Mongol court wait outside.

8. *Folio 90 verso* : Mourning over the coffin of Changhez K͟hān after his death on 18 August 1227, later his coffin was taken to its secret place of burial near the sacred mount Burgan Qaldun. It is related that anyone whom the funeral cortage encountered was put to death.

9. *Folio 20 recto* : Batu and his army make a night attack in 1235 on some Christian tribes in the Caucasus and Bashgird.

10. *Folio 20 verso* : The "Quriltai" of the Mongol princes prior to the Russian compaign of 1236. This is a remarkable work showing the seven princes in full face seated in a row on a huge throne like furniture. The careful symmetry of the monumental character of the composition is, according to Gray, reminiscent of the medieval wall paintings of Central Asia and the Ghaznavids.

11. *Folio 21 verso* : The pavilion called Frashi, built by order of Uktay Qa' an in the city of Qaraqorum with gold and silver statues made so as wine and *gumiz* deposited in them should run out of their mouths. This full page miniature is undoubtedly the most interesting and important work in this MS. Grary notes that "nothing like this miniature is known from any other manuscript of Ras͟hid al-Din, nor is there any other illustration of this famous construction, either eastern or western, earlier than Bergeron's entirely fanciful reconstruction published in 1735 (printed in 1729). It is indeed the only representation of Qaraqorum at the time when it was the capital of all the Mongol dominions, to supplement the descriptions given by Juvayani and at first hand by Friar William of Rubruck". From the latter's testimony it is known that the pavilion and fountain was completed in March 1254. The most striking fact about it is that the architecture is unmistakably Chinese and not Persian.

12. *Folio 58 verso* : Chaghatay, son of Changez K͟hān, with his queen on the throne of Bishbaligh. This is a fascinating work with male and female courtiers and attendants happily mingled with nature in a landscape setting.

13. *Folio 101 recto* : The general Monkasar investigating a plot by the descendants of Ogotay against Mangu, the newly appointed Great K͟hān. This is an interesting composition with Chinese clouds, flowers, and landscape mixed with vegetations and rocks of fantastic shapes and colours of early fourteenth century Persian style.

14. *Folio 120 recto* : Hulagū Khān holding a feast before setting out to conquer the Isma'ilicastles in Khorasān in the spring of 651 H (1253 A.D.).

15. *Folio 55 verso* : Hulagū Khān and his army making the journey from Bistam for the capture of Ismalili castles in 654 H.

16. *Folio 105 verso*: Mourning over the coffin of Mangu Khagan, who died in China on August 11, 1259. Gray has pointed out close similarity of composition of this miniature with the scene of the funeral of Hulagu in the *Jāmi' al-Tawārīkh* MS no MS. sup. pers. 1113, Bibliotheque Nationale. The Paris miniature lacks the richer colour tones and livelier character of the Calcutta miniature and the former has lesse details and a lesser number of figures. The dramatis personae in the Calcutta miniature have lively expression and plenty of interest.

17. *Folio 105 recto* , Qubilay Khān and his followers crossing the river Narun over a bridge of boats. "This is one of the most ambitious of the compositions in the Calcutta MS and nothing like it is known elsewhere. The sky in deep, strong blue, contrasting with the blackish-gray of the silver waters of the river.... The horses are vividly drawn, especially one swimming for life, and the leading one on the bridge, shying". The clouds are less Chinese, rocks developing toward the Timurid convention.

18. *Folio 53 recto* : Feast of Qubilay Khān after his final victory over his brother, Arik-boga and his enthranment as ruler of Mongolia.

19. *Folio 56 recto* : A Mongol prince on the throne with his wife, probably Mubāıak Shāh or Buraq.

20. *Folio 56 verso* : Buraq usurp the throne of Mubārak Shāh, who was converted to Islam and recognised as the ruler of the Chaghatay tribe in 664 H (1266 A.D.) A well-finished closely-knit group with particular attention paid to the expression of the figures and to their costumes.

21. *Folio 44 recto* : The battle between the armies of Tuqatay and Nuqay in 698H (1298-99 A.D.) on the River Don, in which the former was defeated. A remarkable work with considerable dynamism shown through swift-moving horses, two wheeled chariots and fiercely fighting soldiers.

As a whole the illustrations of this codex provide us with stylistic elements which are considerably different from the mellow, crisply linear and highly Chinese-influenced style of the Rashīd al-Dīn codices prepared in his own scriptorium during his life time, yet stylistically earlier than the early fourteenth century manuscript on the same subject in the Bibliotheque Nationale, Paris. The MS calls for intensive study by competent scholars in the field as it is bound to shed much new light on the early development of the Persian style.

ARCHITECTURE

SOME ARCHITECTURAL ASPECTS OF THE ULUGH BEG OBSERVATORY

G. A. PUGACHENKOVA

The Ulugh Beg observatory in Samarqand has never failed to attract world-wide attention.[1] A unique structure with a giant integrated astronomical instrument enclosed in an architectural form, the observatory has evoked great interest among the historians of astronomy and architecture alike. However, the monument has been in pieces only bricks for centuries, having rather insignificant remains of a foundation and pits preserved, as well as a section of meridian arc cut in a rock. Unfortunately, the written evidence on the observatory is but scanty and vague, and, hence, the idea of the original structural components and the integral architectural shape is still a subject of ever lasting debate.

The observatory was first located by Russian regional ethnographists and corroborated by archeological excavations conducted in 1908-1909 and 1914 by V. L. Vyatkin[2]. The diggings revealed a section of foundations of a large rounded structure with a ditch of the former giant instrument cut deeply into the rock and splitting the structure along the axis north-south. On the strength of the available data, an astronomer V. M. Milovanov[3], had suggetsed a schematic reconstruction of the Ulugh Beg observatory, which in his opinion, was a combination of low horizontal circle, that served to determine the azimuth of celestial bodies, partly rising above the surface and partly running into the rock.

A booklet of M. E. Masson was published in 1941, which summarised the data both on the Ulugh Beg observatory, and on the development of astronomy in the Middle East. In the same year, the observatory became an object for investigations by Samarqand archeological expedition led by M. E. Masson. The excavations which were initiated by I. A. Sukharev brought out a new data on the composition of the structure[4], but planned work was interrupted by World War II, and Sukharev was killed in action. Later, his data were utilised by B. N. Zasypkin—an architect who took it as a basis for a graphic reconstruction of the building structure. Thus Zasypkin imagined it to be a complicated composition of rectangular volumes of different heights set on a rounded foundation[5], However, in 1954, B. N. Zasypkin thought of a new interpretation and expounded it to the Uzbek Telegraph Agency correspondent in the following way : "The observatory building had a rounded shape with arcs, that were arranged in three floors with a total height approximating 22 mm. From the south and the north, the building had two towers rising above the ground some 35 mm. A horizontal circles intended for the azimuths to be determined was arranged on the second floor, the

ceiling of which was supported by marble columns. From inside, the building had a facing similar to that of the Bībī-Kẖānum Mosque. On the floors, column halls and service premises were arranged[6].

As far back as 1941, G. D. Dgalalov[7]—an astronomer of the Tashkent observatory observed the degree index marks preserved on the plates and as revealed in the course of diggings. He compared the data with some other information and came to the conclusion that the main instrument of the observatory was not a quadrant (a quarter of an arc), but one well-known to the astronomers, "*Fakhrī sextant*", including only 1/6 of an arc. In fact, such an instrument was once mentioned by one of the founders of the observatory-Giyāt̲h̲uddīn Kus̲h̲ī. A similar conclusion was arrived at by Kary Nyazov after a thorough processing of written sources and this was also adopted by astronomer V. P. Scheglov[8].

Excavations on a large scale, but not completely, of the remains of observatory were carried out in 1948 by an archeological group of the Uzbekistan Academy of Sciences led by V. A. Shishkin[9]. These provided some verification of the foundation plan contours, which was subsequently used by B. N. Zasypkin to suggest another, notably corrected, graphic reconstruction of the building. The plan, cross-section and facade of it were given in the study made by Kary Nyazov[10].

V. A. Nilsen, who participated in the excavations carried out in 1948, made several observations and suggested an alternative reconstruction, slightly differing from that of Zasypkin, giving a corrected lay out. Further, he suggested another architectural solution in terms of a cylindrical surface.

Both the experts reproduced the observatory in the form of a massive cylindrical volume with three premises, similar in floor-plan included therein.

From outside, the cylinder is subdivided into three circles with the surfaces having decorative coatings made of glazed bricks. According to Zasypkin, all the three circles were broken down into dead wall arcs, while according to Nilsen[11], these arcs were arranged as two upper circles, the lower one being smooth.

Both the reconstruction patterns were strongly opposed by G. D. Dgalalov[12], who considered the observatory to be a circular court, enclosed by a low barrier with the 'Fuk̲h̲rī Sextant' positioned on the main axis and the half circle of large sundial, on transverse axis. Within the sectors formed by these high structures and circular barriers, the various astronomical instruments were installed on solid foundations inside an enclosed space. However, he paid little or no attention to the strict lay out of various premises revealed in the diggings of the foundation sectors.

In 1967, U. F. Burjakov carried out further excavations, with threw additional light in respect of the ground floor lay out[13].

A significant contribution to the verification of a number of problems related with the history of the observatory was made by the publication of a letter by G. Kushi, first in Persian language, then in Turkish and English and in 1970's in Russian[14]. In 1960, A. Sayali[15] published in Ancara a study on the Moslem world observatories, a considerable part of which was devoted to the Ulugh Beg observatory, along with the letters of G. Kushi.

As for the reconstruction of the appearance of the observatory, the author had investigated the problem and suggested an idea opposite to that of the earlier experts[16]. We shall discuss this later.

It should be noted that the experts in history of a architecture have once again approached the problem.

L. U Mankovskaya[17], in her paper on typology of the Central Asian architectural trends in the Middle ages proposed that the observatory building included two floors with a height of 10 m with flat roof intended for the astronomical instruments to be installed, with a barrier surrounding it along with perimeter; the cylindrical structure was separated into two circles and had three-row dead or through arcades on the barrier.

M. S. Budalov, who prepared recently a special paper on the Ulugh Beg observatory, pointed out certain other considerations[18]. Once again he returned to the idea of a central meridian arc being a quadrant and not a sextant, and introduced a quadrant into a full height of that huge cylinder. Like Zasypkin and Nilsen, he arranged inside the cylindrical three floors analogous in plan, the outside of the cylinder being divided into seven equal ornamental circles. At the roof of a cylinder volume, an azimuthal circle was arranged along with the brinks and a quadrant and sundial within the central zone.

We do not share the idea of such a reconstruction and we consider it necessary to examine three aspects to begin with :

(i) Documentation of earlier architectural diggings which disclosed the remains of foundations representing the lay out of the observatory ground floor and a number of architectural details;

(ii) The functionality of a building intended for purely astronomical purposes, determining architectural and planning techniques; and

(iii) Validity of drawing analogies from the eastern observatories specially the Indian observatories of the 18th century A. D.

The archeological-architectural observations as a result of excavations carried out during various periods may well be summed up as follows :

The observatory was founded on rocks of a natural hill. The building was encircled by wall (outside diameter = 48 m) partly set on a rock and partly on a foundation made of rubble stone. The wall brick work has been preserved in few sections, laid in one-two rows. In the course of the first digging, these brick works were supposed to be a thin wall of "a horizontal circle" (V. M. Milovanov), whole G. D. Dgalalov considered them to be a foundation of a thin brick fence[19]. The latter investigations have shown that the outside wall was thick enough, approximating in cross-section to almost two meters.

The Tīmūrīd architectural techniques were distinguished for a specific method consisting of the wall-formation by brick work laid along the outside contours while inside, a backfiling with brick-bats—a method used in walls encircling the Gur-Emir structure in Samarkand. The ground floor lay out is distinctly shaped by the foundation brick work, if seen from inside the encircling wall. Such a plan is given in a reconstruction by Nilsen and we do accept it, though certain corrections were brought about by additional excavation performed in 1967.

The ground floor lay out was symmetrical about the north-south axis and included a cross-like hall in each half, separated into three sections elongated hall with recess, segment-like rooms, four rectangular rooms, and in the northern section, pairs of corridors. As compared with the Nilsen reconstruction we have added the entries disclosed in 1967 from the southern, eastern and western sides. The latter led into the corridor that connected the entry with any section of the ground floor. Moreover, according to us, the window openings had to be spacious and their number large enough to provide necessary illumination of the interior.

The main instrument—meridian arc—is still a subject of numerous discussions as to whether it is a sextant or quadrant.

We feel that the meridian arc is a sextant, since the instrument was intended to observe the Sun, the Moon and the brightest celestial bodies as well. The latitude Samarkand would not demand the fourth part (quadrant) of an arc, 1/6 (sextant) would be enough to meet specific demands. In the Samarqand observatory it was a part of arc with R = 40.2 m deepend in the northerm half into the ground to the extent of 11 meters and elevated somewhat higher than 30 m in the southern half where it was fenced in by dead walls. In the upper part, there was an opening through which the luminary beam passed at the moment of its passing over meridian. The sextant arcs were accurately subdivided into degrees (701.85 mm), minutes and seconds. A span between fence-walls is equal to 3 meters. The floor undoubtedly was represented by a long vault. Contrary to the Zasypkin's reconstruction in which the vault was conceived as a straight structure, we consider it to be inclined at 19° in relation to the extreme angle of the sextant. Straight platforms would have been arranged on its inclined roof for the instruments to be

installed, along with the steps to provide a manoevreability in respect of the opening located at the southern end.

As to the three-circle composition, mentioned in the work of Bābur[20], it would be only natural to ask if there was really a necessity to construct three circles, if we consider the specific astronomical tasks they were designed to tackle.

The replication of a large number of premises arranged on three floors could hardly be designed to meet the demands of astronomers. Their number seems to be too large (more than fifty), with several of them having poor illumination, the others with no natural light at all, or their dimensions could hardly comply with their application (e. g. segment-like sections in the southern half). In our opinion, it would be more rational to arrange them as suggested by G. D. Dgalalov within the rounded yard. However, such a composition is not in consonance with the layout of the ground floor, as disclosed by the foundation remains.

Another supposition suggested by an Uzbek astronomer should be given the most serious consideration, According to him, a specified device *i-tidal* was located transverse to the sextant on the axis "east-west", that had once been mentioned in the work of a co-worker of Ulugh Beg, Birdgandi. The device was expected to serve as an aid to determine the location of celestial bonies (sunrise and sunset, in particular). G D Dgalalov[21] draws an analogy with one of the Indian observatories of the 18th century *i-tidāl* which was probably arranged above the lateral corridor positioned on west-east axis of the Samarkand observatory. However, this transverse structure might have been intended for some other purpose. There is an attractive instrument, called *Samrāṭ-Yantra* in the observatory of Sawai Jai Singh, Delhi and Jaipur. It is rather a large sundial, indicating local time and consists of a vartical wall with two quarter-arcs cut therein and,transverse to it, a sloped structure.

The arcs are calibrated in hours, minutes and seconds, the time being determined by the position of shadow of the respective lateral structure wall in the first and the second half of a day.[22]

We consider that the Ulugh Beg observatory, had a similar sundial quarter-arcs perpendicular to the sextant. Two parallel walls running from east to west and constituting two spacious corridors on a ground floor are obviously seen on the structural plan. The corridors might have been used as foundations for the large quarters first and second circles (radius = 15 m, width = 6.3 m). Their planes were inclined in relation to the inclination of the sextant upper faces. Thus, the sextant was meant for the shadow. Considering the significant dimensions of the Samarkand observatory, we may state that the broad inclined planes might have been calibrated with lines, providing the highest possible time check-up. An

observation of the location of the shadow on the large quarter-dials of *i-tidal* was possible from the sextant inclined roof[23].

Such rational utilization of the *i-tidal* integral set up might have been adhered to in the Ulugh Beg observatory[24].

And what about the lay out of the large observatory circle and its quarter-sections, which were positioned in between the sextant and the *i-tidal* : It would only be natural to ask us what forced the builders to make the observatory rounded, which rendered most of the premises inconvenient with poor illumination etc.

According to Zasypkin, it seems to be more reasonable to introduce the sextant into rectangular or cross-like external wall perimeter, not a circular one, which would simplify an arrangement of various combinations of well-illuminated and ventilated premises. Therefore, if the digging-up of the foundation remains left no doubt as to the existence of the ground floor lay out within the circular shape, then it seems probable that the builders had to follow the pre-determined circular scheme, chosen by astronomers to tackle certain specified tasks, and this would have influenced the building appearance.

Bulatov seems inclined to the view that it was for the azimuth circle located on the observatory roof. However, such a supposition is far from being in tune with the three floors' arrangement. It appears to be a little more logical to arrange the azimuth circle on the first circle, as suggested by G. D. Dgalalov.

According to the data of the Tīmūrīd historian, Mīrkhoud, who was a well-informed person in the courts of Samarqand and Gerat, the construction of the observatory building was headed by outstanding Ghiyathsuddīn Jamshīd and Niẓāmuddīn Kushī (both called "Maulānā"—"metier"). Ghiyathsuddin Kushī was an expert in architecture and its mathematical aspects[25]. It was he who composed a basic lay out of the structure for the outstanding architects to erect the Ulugh Beg observatory with respect to planning and specific spatial solution. It is this fact that prevents us from complying with V. A. Shishkin who maintained positively that "the diggings have left no doubts in regard to the circular wall, that had surely been the remains of the outside main walls. Therefore it could by no means have been an instrument[26].

Still it was not a fence wall only, but an instrument that demanded a circular form of that very type with a significant diameter. A solution to this problem becomes obvious if one considers the specific huge instrument, the *Rāma Yantra* in the Indian observatories in Delhi and Jaipur[27]. The structure is a large hollow cylinder with a massive central column. Its floor cylindrical surface is divided through arcs into three circles, the arcs alternating with abetments and an arrangement corresponding to the grid. The floor is also calibrated with respect to tangent scale. The *Rāma yantra* was designed to determine elevations and

azimuth of celestial bodies and, it corresponded to the instrument mentioned by Al-Bīrūnī as far back as in eleventh century A. D. and known as *ustuvani* which, in fact, was an a strolabe on cylindrical projection[28]. The interior elevation of the *Rāma yantra* is equal to the distance between the column and outside circumference. For convenience of calculations, the graduation has been made on the arc plates. The floor has also been subdivided into sections communicating with the arcs and partitions. The *Rāma yantras* in Delhi and Jaipur are in tune so that the arc positions in one structure comply with the partitions in the other. In the *Rāma yantra* at Delhi, there are thirty sections and arcs, each corresponding to a circumference division of 6°, while in the one at Jaipur, there are twelve sections with angles of 18° and 12° for one instrument and 12° and 18° for the other. The *Rāma yantra* in Delhi, has halls located behind the main cylinder, for service purposes and are distinguished for their considerable dimensions (internal diameter : 14.8 m; height : 7.6 m, though inferior to those of Samarqand observatory).

There are tangible reasons to suppose that the Ulugh-Beg observatory's circular composition was conditioned by a peculiar combination of the sextant and the *i-tidal*, the former designed to observe the Sun, the Moon and the planets, the latter used mainly for observing the Sun and as a sundial, as the large astolabe *ustuvan*. Therefore, the building combined several large astronomical instruments incorporated into a fixed architectural volume, apart from not a few smaller portable instruments.

Quarter-sections encirled in plan by the sextant and the *i-tidāl* walls might well have been used by Samarqand astronomers as a large astrolabe intended to determine azimuths and ascensions of planets. The structure having a large diameter ensured a high accuracy of tangent calculations; one degree on the cylinder internal surface approximated 38.4 cm, the arcs covered 6° and each partition covered 3°.

The astronomers of the fifteenth century were supposed to work in the following way on the floor graduated by special grooves (every 3 degrees) arranged in order to facilitate setting or moving the instruments.

The sighting device was set for necessary azimuth on the floor graduated to read in three degrees by special grooves arranged to facilitate setting or moving the instrument. The observer was expected to track through it either along the respective arc faces or on the vertical bar fixed at the arc axis. The arc, in its turn, was divided by metal bars along the horizontal, the bars spaced probably every three degrees with the spacings decreasing upwards according to angle projections similar to those observed in the Indian *Rāma yantra*. When the star or the planet under observation appeared in sight at the intersection of the horizontal bar either with a face or with the arc axial bar, the observer would determine their azimuth and rising as well as their position relative to any other observed celestial body. At the moment when an object under observation was positioned at the

upper edge of the cylinder, the top architectural shape obtained the primary significance; the appearance of the observed celestial body thereon was fixed by its projection with respect to the floor corresponding section. Calculations would be made with reference to the tangent angle determined, which was fixed by the observer for accurately predetermined dimensions of the respective projection corresponding to that angle either on the floor or on the wall.

Incidentally, several fragments of stone plates with graduated circles of large diameter show that they were intended probably for the bronze plates to be set in stone.[29]

In conditions when there was no telescope, and the only "instrument" used was the observer's keen eyes, such a system comprised large scale observation devices facilitating the location. The calculation in respect of the celestial bodies was certainly of primary importance. Within the limits of possible observation conditions, the astronomers[30] succeeded in obtaining not a few accurate calculations in the Ulugh Beg observatory's cylindrical "quarters"—*ustuvanī*. The missing calculations were supplemented by individual observations, carried out with smaller instruments, described in many astronomical studies by G. Kushī (e. g. published in 1416 or mentioned in his letter to his father[31]). These devices might partly be kept in premises or on the observatory upper platforms arranged along the outer circle and above the platform/sextant.

There appear to be certain contradictory elements with regard to the immediate creators of the Ulugh Beg observatory—astronomers and architects as well as the references in literature. According to 'Abdurrazzak Samarqandī, the construction was begun in 1420[32]. Another historian of Timurid times, Mīrkhoud, while mentioning the Ulugh Beg's madrassa construction (the construction terminated in 1420), stated that "the decree had been promulgated for the masters to begin the observatory construction".

It should be noted that the outstanding astronomers of those time like Jamashīd, Kashī and Kūshī participated in the event[33].

The data of both historians are well supplemented by the letter of Giyathsuddīn Kūshī which contains evidence of fierce scientific disputes that had taken place in the Ulugh Beg madrassa, with the well-informed monarch participating in them. Since the madrassa had students studying therein, the disputes took place after 1420. This very fact gives rise to certain doubts as to the dates (1417) mentioned in the letter of Giyathsuddīn Kāsh[34]. Similarly, there are certain doubts with respect to the date of the construction of the observatory (beginning in 1420), mentioned in the students by Abdurrazzaq and Mīrkhoud. It is mentioned in the letter[35] of Kūshī that "at present most works were completed. Up to five hundred *tumans* were spent on bricks and lime, one armillary sphere was completed and

another was started. Such instruments as azimuthal quadrant, an instrument with sliding sights and some others are half done"[36]. In other words, the main structure was almost completed, the instruments were either made or half done. But according to Kūshī again, "it had not been the time for the most complicated works to be carried out, since the structure was still in the process of mounting. The construction was completed and the instruments mounted at proper positions, the observations were to be started" (the letter contains the list of observations)[37].

As to the builders of the observatory, who were the most experienced masters of Samarqand and other cities, the respective data might also be found in the letter of Ghiyathsuddīn[38]. While describing the arrangement of meridian directions, that had been performed in presence of Ulugh Beg and other famous persons, Kūshī stated,[39] that "the levelled platform had been prepared by the most experienced brick layers"[40]. In the aforesaid circumstances "the son of an architect, who headed the bricklayers (ref : translation made by G. P. Sobirove[41] and A Babaeva[42]) of "the son of outstanding architect-head of architects (ref : translation by D. U. Usupov) had some doubts as to the equilateral triangle arrangement. Having explained the technique, Giyathsuddın named him as master (*ustād*) Ismāil.[43]

Thus, the leading master, Ismail was supposed to have been a son of a famous architect. M. S. Bulatov is inclined to identify him with the builder of the Ulugh Beg madrassa in Bukhāra (1417), Ismāil B. Takhır *Isfahānī*. In fact, he was the leading architect in the time of Ulugh Beg as well as builder of the observator,[44] However, a single coincidence in respect of the names does not mean much, since the name (Ismāıl) was widely spread in the Moslem world. Moreover, Ghiyathsuddın Kūshī did not mention Ismāıl as an architect (*mukherdīz*) but as a master (*ustād*)—the head of bricklayers' team; the creator of the Bukhāra madrassa was known to have been an architect. Finally, Ghiyathsuddın did not mention anything about the participation of Takhīr in the construction of the observatory.

But, Bulatov proceeds further, and accepts an earlier view that Ismāıl B. Takhr was a grandson of Muhammad B. Mahmud Isphakhanı—builder of madrassa and the court in Gur-Emır in Samarqand[45]. However, these facts are still in the nature of suppositions only.

The beginning of the construction of the observatory could go as far back as 1420, and in the light of the available data, it should be noted that the construction was not terminated in the period as related in the letter of Ghiyathsuddin Kushī. Nevertheless M. S. Bulatov considers that the construction of the observatory terminated in 1420 and that Kāshı worked out instruments for the observatory in the period stated in the letter under reference. Some experts considers that Jamashıd Kashı to have been an author of the observatory project[46].

Now let us consider the reconstructional aspects of the observatory again. Its planning and spatial composition may be described as consisting of a cylinder with a smooth ground floor and two-circle arc composition of angle quarters, separated along the "east-west" axis by vertical structure of *i-tidāl* with quarter-recesses, and along north-south axis by the sextant structure. Such a complicated engineering structure could only be erected, provided the highest accuracy level of all lines, directions and divisions are known.

The external architectonics may be represented in the following way. The ground floor was smooth, hardly it was divided even with wall arcades, since the lay-out of the rooms could in no way correspond to the axial division of the upper arcs. There were thorough arcades with traditional rectangular framework of pointed arcs on the second and the third circles.

In the reconstruction, suggested by Zasypkin and Nilsen the circles had wall arcs, about 32 in number, arranged thereon. However, the division pattern for an observatory would be generally dependent upon the convenience of azimuthal notation, not on architectural considerations. If a circumference is divided into 32 parts the angles are obtained equal to 11° 14′, obviously unsuitable for the calculations to be carried out. Similar to the Indian *Rāma Yantra*, the cylindrical volume of the Samarqand observatory was undoubtedly subdivided with respect to the highest possible convenience for calculating a number of angles.

If we consider the significant structural dimensions, the division might well be within 3°, the arcs covering 6° and the partitions, 3°. Chords of an arc were equal to 2.5 m and 2.3 m outside and inside, respectively.

In order to calculate the dimensions of the structure, we here used the following initial data. The total interior height of angle quarters was calculated similar to the Indian *Rāma Yantra* in relation to the distance from the quarter angle to the cylinder internal surface and was found to be equal to 17.42 m. The *I-tidal* with 15 m radius—was enclosed within the limits of this interior. The height of the ground floor corresponded probably to each of the upper circles and approximated to 8.71 m (partition included). The total cylindrical height, therefore, was 26.13 m. The height of the sextant in its southern section was 30.5 m above the ground and it was slightly towering over the cylinder. The sextant-inclined roof had steps for the portable instruments to be installed. Entrances into the ground floor were arranged along the main axes. Two stairs leading on to the first floor and to the southern edge of the cylinder wall were probably arranged below the foundation brickworks. The stairs were leading on to the northern edge of the cylinder wall or the sextant roof on the main axis at the northern end of the sextant, where the massive foundation remains have been found.

The structural ornamental pattern does not differ from that of the architectural characteristics of the Ulugh Beg epoch. The building was made of burnt

bricks faced by blue, white or dark-blue glazed bricks, although black glazed bricks, which have been found during the excavations. could be regarded as a speciality of this structure. Perhaps, these bricks might have been used on a large scale, for geometrical decorative patterns on arcs. A majolika or mosaic was supposed to have been employed for the decoration of arcs as well. The cylinder was probably decorated with multi-row stalactite cornice—the *sharaf* characteristic of the Tīmūrīd architecture.

It would be desirable to touch upon the description on the semi *kasri-mikarnas* mentioned in the work of Ábdúrrazaq Samarqandı. V. A. Shishkin considers it to be a purely rethorical expressions, which compares the observatory with the "seven heavens" of the Middle Age cosmogony[47]. L. U. Mankovskaya and M. S. Bulatov are inclined to consider it as an indication of the division of cylindrical surface by seven ornamental circles. According to Bulatov, such a wall-tectonics expressed by horizontal circles on a rounded surface of cylindrical volume, is similar to the circles on the round minarets of Central Asia[48]. However, there are certain objections to this view, since the horizontal circles were characteristic of Central Asia, and the Iran minarets of the period 11-15th century A. D. as well as the minarets of the Tımūrıd peıiod had the spiral-like decoration. It should be noted that the Arab in-Persian expression *mukarnas*, has many meanings, but does not at all mean a circle. This expression implies a high, round decorated structure as well as a decoration (*majolica* or *mosaic*), a stalactite systems. stalactite cornices (the Russian word cornice may be a derivative of the eastern word *mukarnas*). The word, *Mukarnas* in the sense of stalactite, was well-known to the master-builders of the Middle East and Central Asia as well. The fact that Ábdúrrazzaq Samarquandı mentioned the seven-row stalactite cornice decorating the cylinder, might well support the analogy with "seven heavens".

The Ulugh Beg observatory is the unique structure known all over the world. First of all, it should be regarded as a sophisticated astronomical instrument, with a wonderful architectural effect. Following Ulugh Beg's death (1449) owing to an internal feud in Maverannah lead by the ignorant dervish Khodga-Akhrar, the observatory was ravaged and plundered (fortunately, Álı-Kushchī succeeded in taking the scientific material of the observatory out of Samarqand in time). In the beginning of the 16th century, the cylindrical structure was devastated and hence fell into pieces up to its very foundation.

Some two and a half centuries thereafter Sawai Jai Singh II, the Mahārāja of Jaīpur, who was an outstanding astronomer, undertook the construction of observatories in Delhi, Jaipur, Mathura, Banaras and Ujjain. It is to be noted that in the Introduction to the Astronomical Tables compiled by him, there is a clear indication that a number of instruments "were designed similar to those used in Samarqand"[49]. The Indian builders and astronomers could hardly have known the instruments of the Samarqand observatory, as they were destroyed by

them. Possibly they might have used only the preserved written sources[50]. Nevertheless, they had taken into consideration the disadvantages in the combination of several astronomical instruments in one building and preferred an integrated architectural solution for individual astronomical instruments. Hence, the Rām Yantra has been erected separately. The *Sāmrāṭ Yantra* has been erectcd a little away from it and not united with these extant and the quadrant; a number of other instruments distinguished for their specific architectural shapes have been constructed contributing to the peculiar architectural solution in respect of the Indian observatories which still attract world-wide interest and admiration.

The Ulugh Beg observatory is a unique architectural monument of the Middle East. An experience, gained in scientific-graphic reconstruction of its initial appearance is still a very interesting and fascinating problem, containing a good deal of mystery. The fact that there are widely different interpretations of the available data, testifies to the effect that most conclusions are based generally on suppositions. It could hardly be stated that the problem is solved completely. Precisely for this reason, a categorical negative answer has to be given to the recently suggested idea of constructing on the Samarqand observatory foundation, the extremely doubtful version of reconstruction[51].

The discussion should be considered of being incomplete. Hence the author has attempted to advance one more argumentation in favour of her graphic reconstruction version for the Samarqand observatory.

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19. There were no remains of the transversal wall of the foundation found out in the diggings carried out in 1967, which had been interpreted as an indication of its absence (see Gulamov-Burakov, p. 70, fig. 2). However, the sextant as a working instrument, had to be enclosed by a fence (in subsurface section) that might well be stolen.

20. *Bābur-Nāme*, Trans. by M. A. Salje, Tashkent, 1958, c. 61.

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23. Though the quartes of the *i-tidāl* are inclined in somewhat different way from those in the Indian Samraṭ Yantra, they might have been used as a sundial—see the letter by G. Kushi, *The design of sundial on the wall of Ulugh Beg Palace*, the wall not running over the meridian plane ("Letter" p. 187. p. 48).

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40. "The letter", p. 199, p. 51.
41. "The letter" p. 190.
42. "The letter", p. 51.
43. "See notes 40.
44. Bulatov, M. S. p. 179.
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ARCHITECTURE OF INDIA AND CENTRAL ASIA —RESEARCH COMPARISON

V. L. VORONINA

The question of comparing architectural schools of India and of Central Asia has not been aroused yet, and the attempts of such analyses bristle with certain difficulties. In all, its historical periods, India's architecture is characterised by unique features and, in its major part, is uncomparable with the building culture of the Middle East. The architecture of Delhi Sultanate and of the Mughal period, when Islam spread throughout the country, adopted a new ideological base which was different from the previous one and acquired new functional tasks. Nevertheless, strong traditions of its past lent a special colour to the architecture so that the types of the buildings, their forms and constructions, familiar to the western neighbours, became unrecognisable.

This article, with no ambitions to be regarded as a thorough analysis, tries to suggest the possible ways of comparing architectures of the two countries, where the roots of artistic culture go back to antiquity. In spite of the originalities of the cultures of India and Middle Asia, there are common features which appear even at the early historical stages. In the artistic iconography, certain images established themselves, reflecting the content of the ancient folk beliefs—the ones connected with the fertility cult—yakṣi, water monster, *makara*, the guarding sign *kirtimukha*. The core of the myth was the cult of life-giving water. Worship of water was reflected in such written documents as the *Ṛgveda* with the Indians and *Avesta* with the Iranians, including those living in Middle Asia. Water was considered as one of the saintly media of zoroastrism. Religious concepts too acquired visual representation in art. Water streams, inhabited by real and legendary creatures, became common subjects of the symbols of the temple. In particular, a clay panel of the ancient Pendzhikent temple depicted the wavy water surface with half lengh human figures, fish and tritons, floting on the waves. The main character has a human corpus with two fish tails and other details of the relief also find close parallels in the Buddhist mythology as well as in Indian iconography. A.M. Belenitsky supposes that Pendzhikent relief depicted not the water medium in general, but the particular river, Zerafshan.[1]

The theme of water-cult in its all-embracing idea of abundance and fertility was reflected by the capacious and obvious symbol that has adopted a form of "inexhaustible vessel". This vessel ejects flows of water on Shumer reliefs and, on the stamps from Shumer and Susa, it also decorates Sassanian cloths. *Pūrṇa ghaṭa* became a fertility symbol in India—a vessel with the flowers of a water-plant-lotus. *Pūrṇa ghaṭa* can be traced to the Buddhist monumental reliefs of the

second century B.C. (stupa of Sanchi and Barhut), and after the fifth century A.D., it spreads into Indian art (mural paintings of Ajanta).[2]

Architecture as a space art expresses the idea of fertility in capacitive and touchable forms. A support, in various types, proved to be an architectural detail and suited as a constructive and decorative element was made of stone or wood.[3] In India and Middle Asia, this idea acquired clear forms though the architects treated it in different ways.

In Indian architecture, the symbol of *Pūrṇa ghaṭa* assumed the form of a capital. The paintings of Ajanta (fifth-seventh century A.D.) are in the nature of engraved on wooden columns; tiny posts are crowned with well-proportioned capital in the form of a cup or a small jugh[4], (tables 20, 40, 42 etc.). The mighty pillars of the rock temples of the fifth-eighth centuries look quite different. Their capitals are divided into two types. The first type imitates in all details the shape of a squat vase with ribbed body with streams of water running out of it as well as flowers and buds of lotus. The others are of the shape of a round pillow in which one can hardly recognise a prototype of the vessel (Fig. 1). In the eighth century, both these types were synthesized. Gupta motif of the vase with plants, remained in the South-Indian temples up to the eighteenth century.[5] In his work dealing with Indian architecture, E.B.Havell dedicated a special chapter to the symbolics of forms, where he depicted, in details, the usage of flowers, fruit of lotus and water lilies on parts of the column, a rounded fruit of a lily forming a base and the combination of the lily and lotus fruit presenting the form of a domestic vessel on the capital.[6]

In Middle Asia all the parts of the column were submitted to the general idea as follows : the basement of the bearing (support) is a vessel, out of which a bunch of flowers and leaves arises symbolising the trunk and capital. It is supposed that this type of column has its beginnings in ancient times, because vases in the form of a vessel were found by archeologists in the Khwarezm dwellings of the fifth century B.C.—second century A.D. (Fig. 1). Jug-like form of the base remained up to our time, whereas, crowning in the form of truncated cone with flower pattern in the fifteenth century was substituted by stalactites. Capital in the form of a jug was found expression in Middle Asia only on the columns under the entrance arch or of the corners of the mausoleums; seldom can it be seen in the wooden order in southern Tadjikistan : On the basis of similarity of the phenomena, it is doubtful whether Havel's interpretation of the jug-like details as having originated wholly from the vegetable forms is vivid because neither lotus nor water-lily grows in the Middle Asia. It is easier to admit that the forms of water vessels justify their symbolic significance. Folk terminology inclines to this explanation too (*Kusa* in Middle Asia—Kusa and *Kalasam* in India).

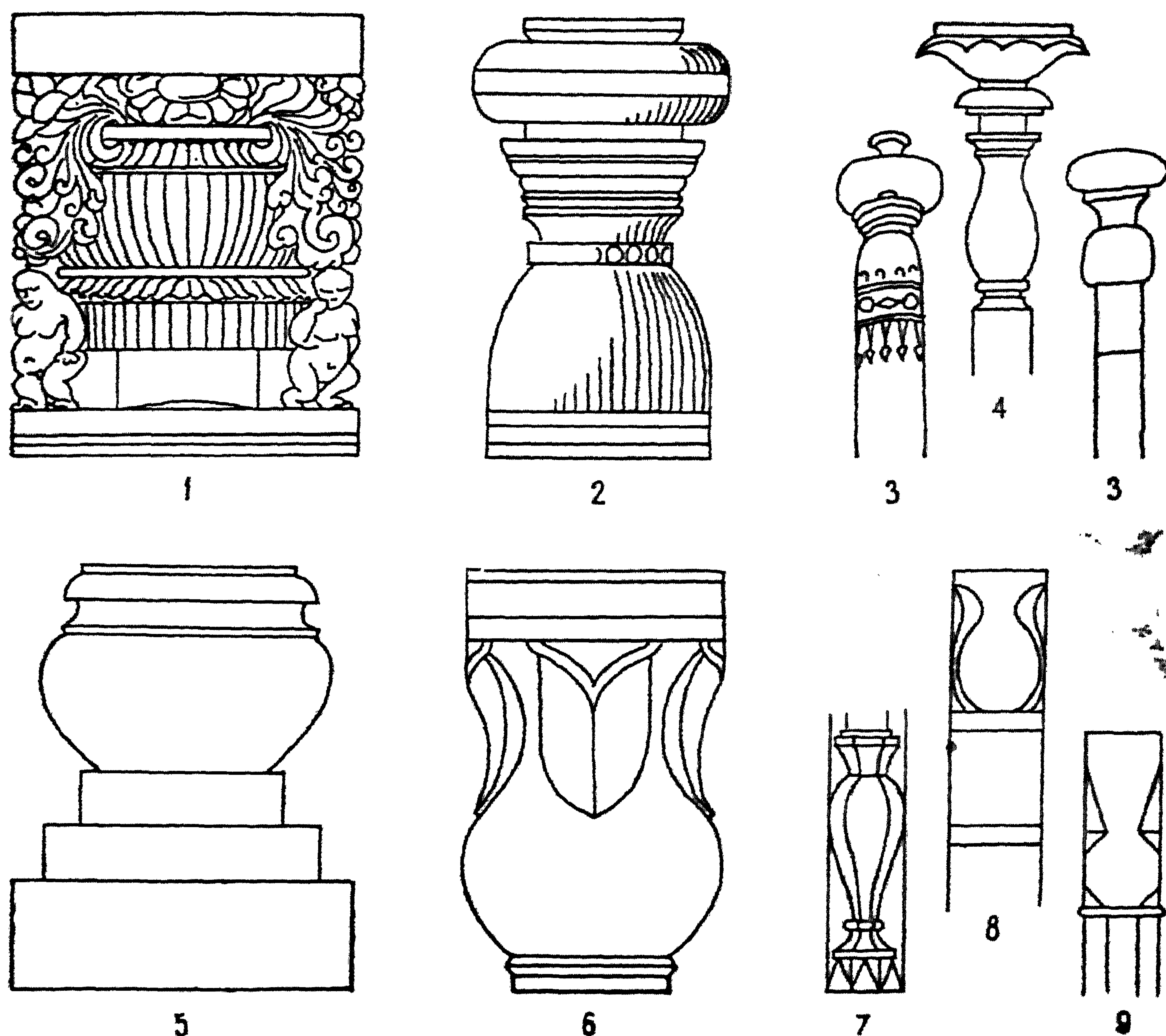


Fig. 1

Not only the world of ideas but even the methods of construction were reembodied in the creations of architects. The wooden constructions of Indian dwelling got their inspiration from the keel-like portals with toothed inner circle of the rock temples-*caitya*, the former, in their turn gave an impetus to the development in the East of the horse-shoe shaped and scallop arches.[7] No doubt that the decorative, three-end section ribs had their beginning as a derivative of the early Indian forms of architecture.[8] Scallop arch with subsidiary ribs can often be observed in the late mediaeval monuments of India.

At the beginning of the thirteenth century in North India, Delhi Sultanate came into being and the penetration of Islam into the country had strengthed the ties with the neighbouring Islamic states. The new cult determined the corresponding construction programme. Mosques of Muslim India have taken the forms which are common in the Middle East with the open multipillar hall in

the back of the yard surrounded by arcades. In large mosques, the main pavillion *maksūra* covered by large cupola, was located on the hall's axis, the wrings were covered by the series of small domes. The plan common to Iran and Middle Asia is violated by the lack of yard portals, but often various other elements appear, such as inner small yards and the varying order of location of supports.

In the beginning of the thirteenth century, the impact of Islam was marked by the construction of Kutb-Mınar in Delhi (Fig. 2), about which a detailed account has been given in another article.

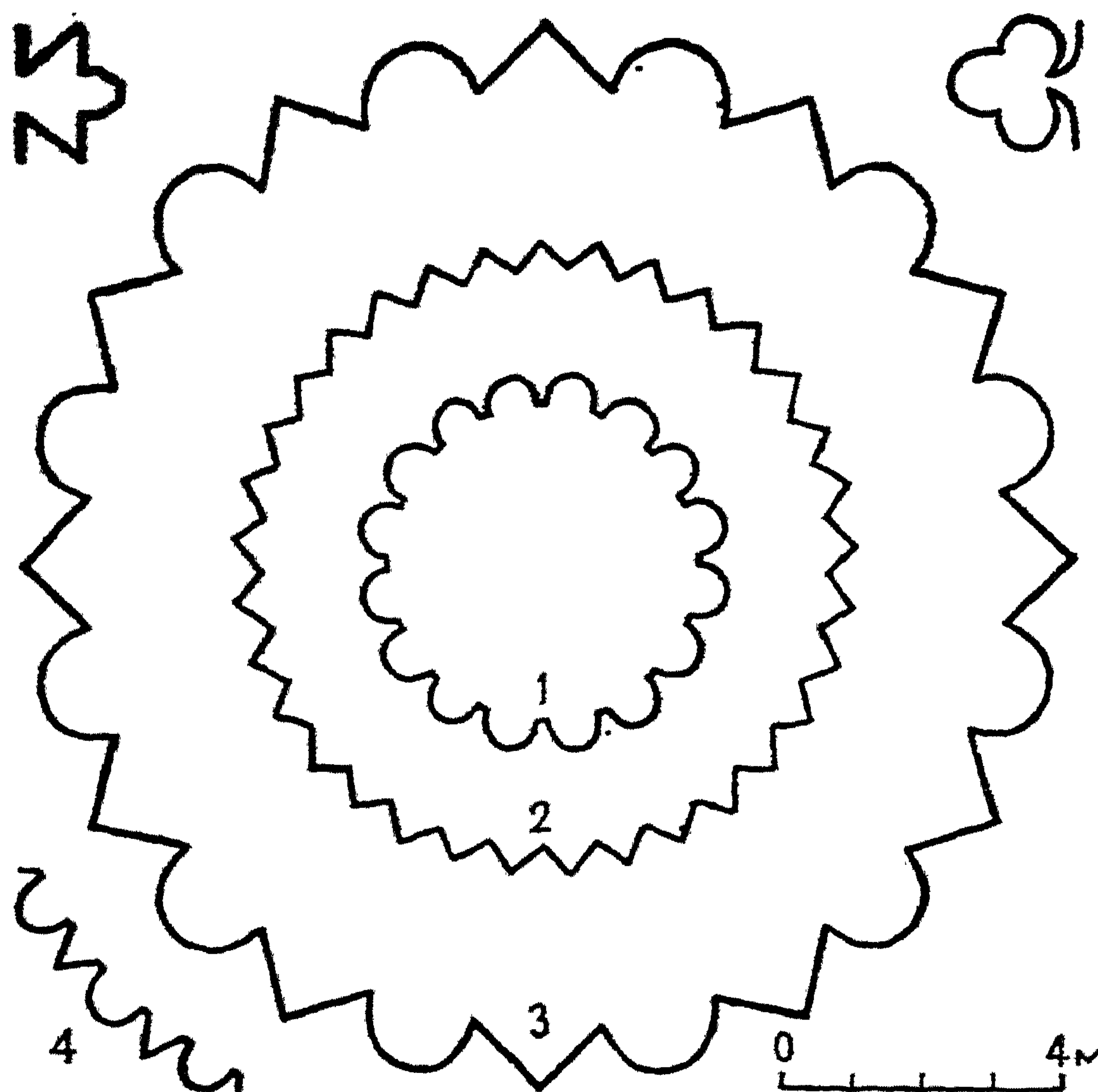


Fig. 2.

It may be noted that the idea of a kiosk-bomb was adopted by Muslim India. Early mausoleums in Delhi and its suburbs belong to this type, though some of them are three-arched and in the western wall *mihrāb* was located. The mausoleum of Ghiyāthsuddın is remarkable for its declivity of walls. The small white-marbled bays crowing the facades resemble, in some respect, Bukhara's mausoleum gallery.

In the centre of Māndu, capital of Mālva, the cult complex was created : two rectilinear fences form the boundaries of the mosque and the governors' tombs. White-marbled tomb of Khoshang-shāh (1440 A.D.) faces north and south with its six arches, but a larger tomb of Maḥmūd shāh (1450 A.D.) located in a separate yard has twelve arches, three in every wall. Both constructions

have in common with the mausoleum of Samanids not only through passages, but also miniature cupolas at the corners, beside the main dome.

The tradition of central-domed mausoleums is continued in the seventeenth century in the gigantic construction of *Gol-Gumbaz* in Bījāpur, wherein Muḥammad 'Ādil-Shāh is buried. Though the two-axial symmetry here is violated by the large *mihrāb* protruding to the west and, in spite its frightening dimensions, *Gol-Gumbaz* looks like a hipertrophied model of the Samanid mausoleum. If the corner columns are missing in the other Indian monuments, here they are substituted by the powerful multi-tier towers; still more resemblance with the Bukhāra mausoleum becomes noticeable in the crowning gallery turning over the facades in three tiers (the upper two are hidden in the walls—Fig. 3).

There is the typological row, where typical features of Samanid Mausoleum vary without fully uniting. The most common feature is the square outline of the plan, but the interior is not opened equally. In the mausoleum of Ghiyāthuddīn we see some outer similiarity of a gallery. The Māndu tombs are five-domed, but do not have gallery and angle towers: The *Gol-gumbaz* does have both a crowning gallery and huge angle-towers, but it lacks small domes.

The dimensions of the monuments vary greatly. The Samind mausoleum is 10.8 × 10.8 metres, while Muḥmūd-Shāh's mausoleum is 27 × 27 metres; the diametar of *Gol-Gumbaz* is 46.5 meters higher a height of some 60 meters. To keep to the compositional principle it was necessary to vary the proportions and details, increasing the quantity of apertures and converting the angle columns into the real towers—the scales of *Gol-Gumbaz* being understandable only due to the segmenting of 7-tier towers. The Mausoleum of Samanids remains still the most proportional and harmonious building with its relatively small dimensions. Its features, if enlarges to the scale of *Gol-Gumbaz*, lose the expected balance of proportions.

The monuments of Māndū and Bījāpur belong to the epoch of the great Mughals, when all the main trends of architecture were directed towards complicated forms, with an emphasis on the ornamentation. The most famous tombs of that time are the octahedron Sher-Shāh mausoleum in Sasārām (1545 A.D.), situated amidst an artificial pool; Humāyūn's mausoleum in Delhi (latter half of the sixteenth century) and, more importantly Tāj Maḥal in Āgra (middle of the seventeenth century) with its height of 74 meters. All these monuments do not yield to *Gol-Gumbaz*, surpassing the latter by the splendour of forms and ornamentation. The main halls of the tombs in Delhi and Āgra are supplemented, in their angles, with the cutting volumes above which light-domed pavilions are located. Here the features so familiar in Middle Asia, appear the vaulted portal in a rectilinear frame with arched openings or panels on both of its sides. The white-marbled facade of Tāj Maḥal, incrustated with precious stones, exhibits

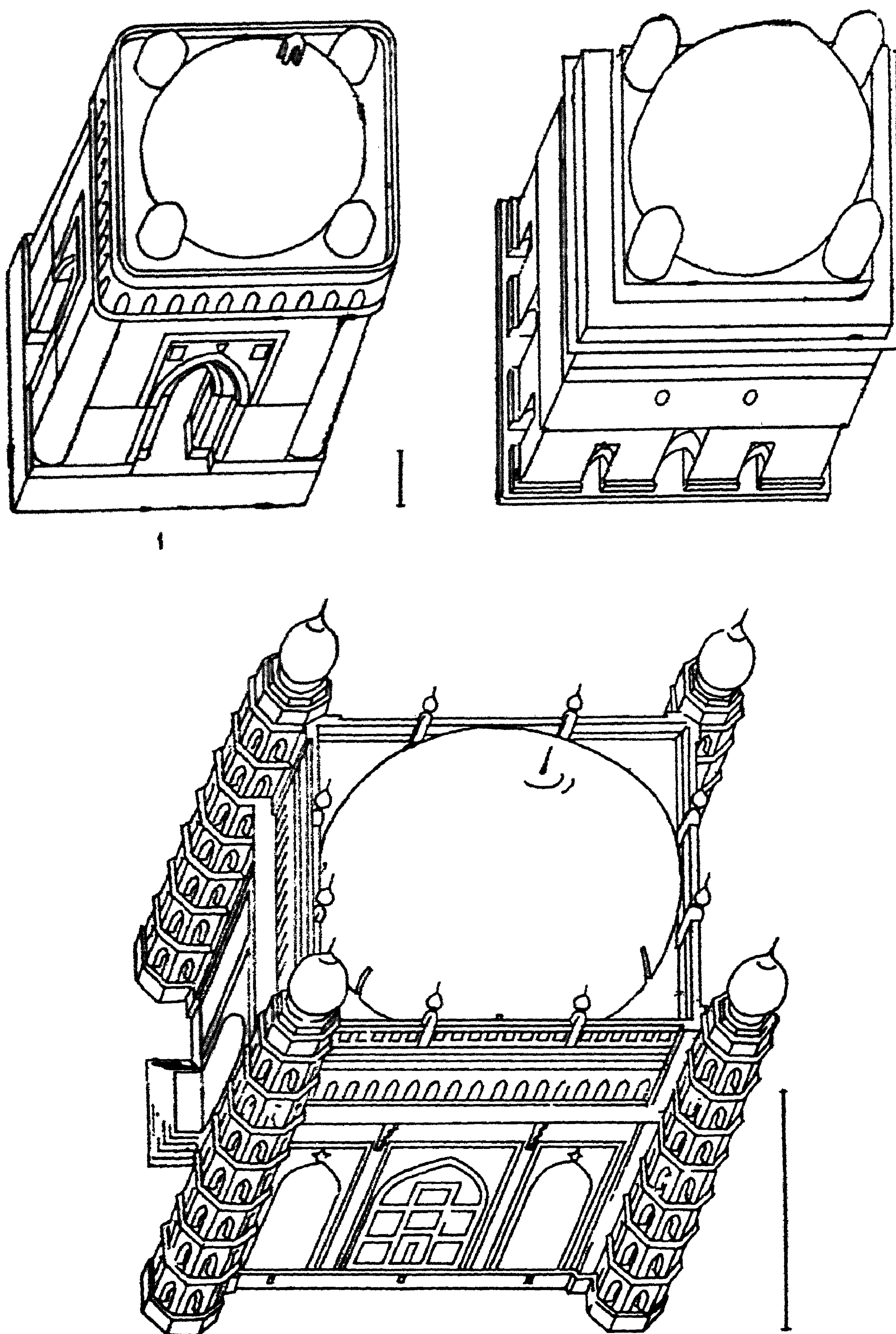


Fig. 3.

its reflection in the pond. This great monument is a peak of Indian memorial architecture.

It would be appropriate to compare the principal approach towards the construction of tombs in the Indian and Middle Asian Mughal dynasties. The ruler of a vast empire, Tīmūr had envisaged to tomb and a crypt for his own burial inside the large building of Dorus-Sijadat in Shahrisjabse, considered as a dynastic memorial of the Tīmūrids. Actually however, he was buried in Gur-Emor mausoleum, constructed for his grandson Muḥammad-Sulṭān as part of an earlier cult complex. In the end of fourteenth century, on Tīmūr's order, the hanaka of Hodga Aḥmad-Yāssavī was erected in Turkestān. It includes of a mosque and a mausoleum. Later, through Samanid's mausoleums of the fifteenth century, Ishrat—Khāna and Aksaray are detached, the practice was to locate tombs under the roofs of madrassa. Such was not the case in India. The tomb of Humāyūn as well as Tāj Maḥal rises on high platforms amidst greenery and ponds, symbolic of heavenly gardens for the souls of the deceased to ascend.

The palaces of the fifteenth-seventeenth centuries in Āgra, Delhi, Fateḥpur-Sīkrī, by richness of their forms and luxury of precious stones, surpass the palaces of rulers of the neighbouring countries. It is difficult to compare them with the Middle Asian ones even, because from all the Tīmūr's palace constructions, only a part of Aksaray's portal in Shahrisjabee has survived. The existing palaces of Khiva. Bukhāra, and Kokand are not older, probably belonging to the nieneteenth-early twentieth century. Besides, the planning of the ensembles of palaces never followed any strict rule, and every time possessed unique features. The common features, however, were rectilinear yards, surrounded by logias and porticos. The symmetrical plan of Fateḥpur-Sīkrī palace is worth mentioning. It has four porticos, located on the axes. Such a plan, typical of Middle Asian constructions was adopted in the case of Lashkargarh palace of the eleventh century (Afghānistān). The Mughal Palaces were strongly connected with folk architectural traditions, and such details as ornamental grids, curved consoles, festoed arches impart a peculiar originality to them. The appearance of Havā Maḥal palace in Jaipur is remarkable for its five-storeyed cell facade.

The Mughals took, from their western neighbours, a great liking for planned gardens and *hammām* baths. *Hammām* as a means of comfort and hygiene became a constant feature of palace ensembles. Akbar constructed in the fort of Āgra "the best bath in the world" with two large octagon halls, used not only for bathing but also for private audiences. Fateḥpur-Sīkrī and Delhi palaces also had *hammāms*, their number increasing in cities.

The Muslim rulers patronised the sciences, astronomy in particular. As early as under the rule of Khalīfā al-Māmūn, an observatory was constructed in

Baghdād and later came up other observaties wherin some outstanding scientists worked. About 1023 A.D. an observatory was erected in Hamadın for Abū Álı ibn Sınā. The Maragha observatory, built in the fifteenth century, housed a large library. The most famous observatory of Ulugh Beg, was built in the fifteenth century in Samarqand, from which has survived only a sextant of 40-metre radius. However, the building itself has been reconstructed in the shape of cylindrical tower. The great Mughals were not left behind in this branch of knowledge and during their time, observatories in Delhi and other cities were built by Maharaja Sawaı Jaı Singh II. The combination of geometrical forms is impressive in Jaipur's observatory (18th century) and its various instruments were used for observing the planetary movements and positions in the open sky.

Let us now consider some details of constructions and ornamentation. The construction methods in the ancient and early mediaeval India are indeed original. For example, no where else in the world, rock-cut temples are presented so richly. In case they were made of the dressed stones, the coverings were of the type of a false vault. With the appearance of Delhi Sultanate, India acquired new construction methods, typical of the architectures of the other Islamic countries, and also vaulted constructions, typical of them. The domes were supported by arched pendentives. It is the pendentives that support the large dome of *Gol-Gumbaz*. In the other tomb of Bījāpur, the mausoleum of the Two Sisters, a three-tier system of intersecting arches, so typical of Tımūrid monuments of Middle Asia, did not find favour. The dome cover structure of Middle Asian constructions began to develop a parting during the period between the eleventh century and the end of the fourteenth century, the inner and the outer domes which are substantially separated, forming a large void. The smart outer dome rises on a drum, increasing the height of the building. In Indian architecture, the dobble dome was introduced only in the sixteenth century, and the dome of Humāyūn tomb is still equat; but in Tāj Maḥal, it rises high above the ground. In the case of public constructions. the arches and vaults are mostly of a pointed profile. Under the portal arch threw-quartered columns are executed, as in Middle Asia, often with a jug-like base and their capitals were decorated with tiers of small arches or stalactites. The walls are surrounded by a marble panel with columns at the corners and in this respect, their resemblance with the ones at Samarqand or Bukhāra is rather astonishing.[9]

The monuments of the great Mughal period are saturated with ornamentations either cut or inlay work in marble, but rarely painted. Glazed rivetment was moderately used. The ornamental pattern was mostly vegetable forms following largely the Middle Asian methods, with repeated motives of flowers and leaves in a typical pattern of *Islimi*. As far as the geometrical ornamentation was concerned, it was represented by a simple combination of geometrical figures. The beam *gerih*, that decorates the Middle Asian monuments, did not become popular in India.

A short excursus into the architectural history reveals a concordance between the constructional ideas of India and those of Middle Asia, especially in the period of the Mughals. This is not surprising inview of the fact that the founder of the dynasty, Bābur, came from Ferganah. Even earlier, there were instances when the Middle Asian masters, specially the architects from Samarkand, were invited to the construction of a madrasa (fifteenth century) in Bidar. The building is made of brick and rivetted by glazed tiles. But the resemblance of methods is not always explained by the direct borrowing. The volumetric ensemble of Māndū and *Gol-Gumbaz* mausoleums hardly needed the direct acquantance with the Samanid mausoleum. The *chortak* type was very popular in the East and can be seen nowadays in some Iranian burials. The *Gol-Gumbaz* towers are a reproduction of the ones from the Māndu ensemble; the crowning gallery was not the feature typical only for the Bukhāra mausoleum, but even in Middle Asia there are such examples like the Sandjar mausoleum in Merv. Besides, it is difficult to separate the influence of architectural schools of the neighbouring Irān and Afghānistān. By and large, the reason lies in the fact that Eastern countries at different stages of their history presented a capacious construction where certain philosophic concepts, artistic culture and construction techniques fermented and ripened. From this common source, separate nations drew the inspiration and made notable contributions. Indeed. neither geographical nor political boundaries could hamper the flight of creative minds.

Notes to the illustrations in the article

Fig. 1. Parts of a column in the form of vessel : 1—capital *Pūrṇa ghaṭa* of a rock temple on the Elephanta island, (8th century); 2—Capital of a rock temple in Badami (9th century); 3—Columns in Ajanta paintings (5th century); 4—Capital of South-Indian timber order; 5—Stone base of ancient Khwarezm, (2nd century); 6—Base of a wooden column of the Great mosque in Khiva (10th century); 7—Base of a corner column of a marble panel in *Gur-Emir mausoleum* in Samarkand (1404 A.D.); 8, 9—Column capitals at the entrance of Uzgen mausoleum and Shāhī Zinda ensemble in Samarkand (1186 A.D. and 1405. A.D.).

Fig. 2. Ribbed towers plan contours:

1—Minaret in Djarkurgan, (1108/9 A.D.); 2—Imāmzada Ábd-Ullā in Demavend, (app. 1300 A.D.); 3—Qutb-Minār in Delhi, beginning of 13th century); 4—Tower in Kashmīr (app. 1300 A.D.) above—teeth of arches in Deggaron mosque (beginning of 11th century).

Fig. 3. Composition of mausoleums:

1—Samanids mausoleum in Bukhāra, (end of 9th beg. 10th century); 2—Maḥmūd-Shāh mausoleum in Māndū (1450 A.D.); 3—*Gol-Gumbaz* in Bījāpur (1660 A.D.) (sideways the linear relation of the monument's width is given).

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ORIGINALITY OF INDO-MUSLIM ARCHITECTURE

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Indo-Muslim architecture means a neat and important trend in Indian architecture which emerged in the Middle Ages in connection with the spread of Islamic religion in India. In this architecture, the true creative co-operation of the Hindus and Muslims revealed itself. In other words, the new architectural ideas in conscience with the Islamic ideology were implemented by the Hindus in an original manner.

Owing to specific cultural and historical conditions of India's development. the Hindus were always known as adepts in the creative mastering of the foreign forms of art.

The ability of the Hindus to assimilate foreign forms of art manifested itself also in a more simple form—in the ability to reproduce foreign objects of art and even European paintings.

In the markets of the capital of the Maurya dynasty (317-180 B.C.) goods from all countries of the world were sold, and foreign artifacts were copied by Indian craftsmen with an unprecedented degree of perfection. This required a high artistic taste, good vision and technical skill.

An example of the court painters of the Great Moghul Jahāngır (1605-1628), is a case in point. One day Sir Thomas Roe, ambassador of British King James I, requested a copy to be made of his original, along with five copies, and the ambassador could not distinguish the latter from his original.

Indo-Muslim architecture acquired a number of Indian artistic features which, however did not affect adversely the general harmony and ideas of buildings. This peculiar synthesis has enriched Indian architecture and made it the world's most varied in forms.

Before the appearance of mosques and mausoleums in India, in which this new trend in Indian architecture manifested itself most vividly, it had represented an evident synthesis with the sculpture, and the very forms of buildings were characterised by a high degree of plastic art. This architecture also reflected the main ideas of Indian philosophy and aesthetics, unity in diversity.

Before the emergence of this new enchanting types of architecture in India, in the other Muslim countries, mature traditions of mosque and mausoleum architecture had been long in existence. Their principles and techniques radically

differed from those of Hindu temples because they were built according to different plans, expressed different ideas and used technique and materials alien to India. They were devoid not only of sculpture but even of plastic decoration. On the common Indian soil, however, new as well as ancient local traditions and principles of architecture were bound to come more or less closer together. A process of mutual influence was under way, and the nature and extent of that process varied depending on the historical periods, India's cultural relations with foreign countries and local styles of Indian traditional architecture. But the main condition of success and easiness of rapprochment depended on the freedom of creation enjoyed by the popular craftsmen belonging to various religions.

In the new Indo-Muslim architecture, the portal-dome type of mausoleums and mosques is predominant, a great role is played by minarets and lancet arches with perfect geometric contours and abundance of floral, geometric and epigraphic ornamentation As a result of vaults made of mortar masonry, more developed inner space has assumed a significant vole. Of great importance have become also such colourful excellent building materials as white marble and red sandstone. New Indian architecture was characterised by a special type of clarity. The encompassing concept and archtectonic qualities became clearer and obtained greater force of expression. An impression of the wholeness of appearance was specifically emphasized in the mausoleum with their central domes and similar facades. New techniques ensured greater durability and saved building materials.

This architecture fulfilled the ideological and aesthetic demands of the Indian clergy as well as the secular Muslim feudals; nothing in it contradicted the notion of a single invisible deity: everything was rational, clear and simple.

The new architecture did receive a powerful stimulus for its development, by the patronage of the rulers (first the rulers of the Delhi Sultanate—1193-1413), arrival of architects from other Muslim countries, better techniques and successful combination of new ideas and experience of foreign architects with the old local traditions and craft of Indian masons. Absence of sculptural forms increased the architectonic qualities, strength and integrity of forms of Indo-Muslim architecture.

The architecture, with time was transformed from imposing monumental forms to more sublime and refined decorative forms (for instance, in the Mughal architecture).

The famous minaret, *Quṭb Minār* built near *Quwwat-ul-Islām Mosque*, is one of the most wonderful early monuments of Indo-Muslim architecture. This strikingly beautiful minaret of cluster form is undoubtedly of world importance as a masterpiece of architecture.

Its construction started under Sulṭān Qutb-ud-dīn Aibak in 1200 and was completed under Shams-ud-dīn Iltūtmish in about 1236. The fourth and fifth tiers were build by Fīrūz Shāh Tughluq, as the old tier had been destroyed by lightning in 1369.

This is one of the highest minarets in the world, with a height of 72.6 metres, diameter of 14.03 metres at the foundation—and at the top it tapers to 3.05 metres. With its majestic appearance and size, excellent proportions, richness and elegance of formso Quṭb Mīnār radiates an unforgettable impression, towering beautifully over Delhi.

The minaret is built of local granite and faced with standstone of two colours: brownish-pink and cream-coloured. The lower tier appears to consist of a tight cluster of semi-columns, alternating with pilasters placed at an angle, the second is of semi-columns, the third, of pilasters in the form of angles forming a multicorner star. The tiers of the minaret are decorated beautifully with round balconies of rich form with stalactites along the lower border.. ....These details affect the smooth surface and give additional beauty to the tower by creating the play of chiaroscuro, which has been a characteristic of Indian architecture since long. The two upper tiers have been restored in the white marble, rather ill-matching in form with the whole edifice. The last tier was crowned by a kiosk[1] with a dome which was destroyed by the earthquake in 1803, restored in 1829 and later removed. Inside the minaret, there is a spiral staircase with 379 steps and outlets to balconies.

Photographs of Quṭb Mīnār fail to produce the desired impression, especially when taken from a great distance. But seen from close distance, it looks inimitably beautiful. The dynamics of the tiers trying to reach the sky is enhanced by their becoming narrower with height and by a variety of profiles of each of them. The balconies create a rhythm of intervals dividing this movement in order to emphasize it again, and increase further with the next tier.

The charm of Quṭb Minār's elegant strength and clarity of forms is enhanced by its soft, pleasant and extremely harmonious colour. As a result of a balance of the aforesaid two alternation shades of stone slabs, an additional impression is created as if, the whole tower is trying to reach the sky. One is inevitably attracted by the change in the shades of the stone and easily follows up the minaret's tiers higher and higher.

Elegant belts with big inscriptions in Arabic or great calligraphic artistry, carved in stone, make a wonderful addition to each of the three floors.

Prototypes of Quṭb Mīnār's forms are found in Central Asia, the closest to it being the ribbed minaret in Jar-Kurgān (Uzbekistan) of 1108-1109 and the one in Konia (capital of Selujiks in Asia Minor).

One of the inscriptions reads: "This building was completed under the guidance of slave Muḥammad Amīr Koh". Other inscriptions mention also the names of Hindus: in the 14th century, restoration was carried out by the architects Lal (Lakshman) and Nah.[2]

The richness of Quṭb Mīnār's forms, their striving for plasticity, and the play of chiaroscuro on the balconies, are the result of a strong impact of ancient traditions upon architectural principles and ideas brought from foreign Islamic countries.

However, just a mechanical application of other people's ideas in construction, mere borrowing or imitating, cannot ensure creation of a perfect architectural monument or a genuine piece of fine art which would be characterised by local features.

This required inspired labour of local craftsment which inevitably implants originality, vitality and artistic dignity to new principles of architecture embodied in material. That was the case with *Quṭb Mīnār*, and how far away it is from its prototype in Jar Kurgān:

On the fringes of the country where local architectural traditions flourished, the latter's influence on the forms of mosques and mausoleums was especially strong. In Gujarat, caste organisations of masons enjoyed monopoly in the sphere of their activities; there were other sources of replenishing the ranks of skilful masons. Because of them, the design of Muslim cult buildings was often borrowed as a whole or partially from Hindu or Jain temples, while the decoration remained strictly Muslim.

Jami' Masjid in Ahmadābād (1423) which is justly regarded, as the best in Western India, evokes admiration, first of all, by its facade, its integrity, strength of forms, perfection of proportions and elegance of details. The central entrance portal is very impressive. It looks like a high lancet, slightly pointed arch of a quiet form riging a little lower than the parapet consisting or pointed petals. The portal is flanked by two columns richly decorated with belts and fluting. On the sides, there are two smaller arches of similar form (without columns), with the same smooth contours. Correlation of the massive portal with the emptinesses of side arches has been maintained in superb proportions. Two blank lower walls serve as the continuation of the arches. The facade produces an impression of confidence of the established local style which is rather majestic. Inside the mosque, on an area of 64 by 29 metres, there is a cluster of high and thin columns (about 300) spaced at a distance of 1.5 metres from each other, forming 15 square grounds with a small dome over each. The impact of pre-Muslim traditions can be easily seen in the form of columns. In the complex inner structure of the mosque with different levels of naves, transcepts and galleries (a kind of entre-

sol), our attention is drawn to central compartment of the sanctuary, similar in design to that of a Hindu temple with its hall of columns—*maṇḍapa*. A purely local traditional method was used in respect of the galleries—the play of chiaroscuro in order to create semi-darkness by permitting only refracted light to reach the gallery.

Compared with the other Indo-Muslim mosques, in the case of Ahmadābād's *Jami'-Masjid*, the building genius of the masons of Gujarat must have used its own traditions, which resulted in an amazing originality in the internal design of the mosque.

The Gujarati architecture continued to flourish under the rule of Maḥmūd I Begarha (1459-1511). In 1484, he transferred his capital from Ahmadābād to Champanīr, where he erected the Mosque, *Jami'-Masjid*, the construction of which lasted from 1485 to 1508. This mosque bears evident borrowings from local temple architecture. It seems that an abundance of small architectural details was intended to substitute for the impression created by the sculptural nature of forms of the traditional pre-Muslim architecture.

Three entrances lead to the square yard (*saḥn*, *ḥaram*) with open arcades on three sides. The sanctuary (*qibla*), as usual, stands with its facade across the yard in its far end opposite eastern entrance. Along the facade of the sanctuary, there are five arc entrances, the central one being higher and twice wider than the side ones flanked by two minarets.

The gate of Champanīr Mosque reveals that the local craftsmen who built it with abundance of various elegant details, did their best to reproduce plastic ornamentation of Indian temples without violating the Muslim ban on sculptures. Here they used openwork niches, carved parapets with a complex system of corbels, kiosks in the corners of the roof, etc.

The ornamentation of a grave dating back to 1525 situated in the yard of *Nagīna Masjid* in Champanīr has been executed with the same desire to diversify the smoothness of surfaces. But from the artistic point of view, it is inferior and its finishing shows certain fragmentation instead of richness and strict elegance of the gate of the *Jāmi 'Masjid* Mosque (1508).

In Sidi *Sayyad* Mosque (Ahmadābād, 1572), in the ornamentation of the window of the sanctuary again, we come across the most interesting feature of the ancient tradition. The window is covered with a screen made of carved stone, as was the custom in Gujarat. On the openwork, there are stylized leaves of a shapely young palm tree, and the space between them is filled with a magnificent foliage, appearing as if it is alive. This intricate carving makes the screen very elegant.

Aesthetic sense of Muslim orthodoxy, as a rule, demanded from the cult architecture, a strict and to a great extent a stylized and even geometrical design of floral motives which were turned into ornamentation. As we observe in the mosques in foreign Islamic countries, the plastic forms were deliberately avoided.

The desire to convey the beauty of nature exists to a greater extent. It would appear as a beautiful forest before a visitor, where at some level the branches intertwine and then again spread freely. A rhythm of rounded flexible branches is emphasised by the slenderness of the palm tree running along the central axis of the screen. This creates an inner unity of the decorative lay out of the screen's ornamentation, its organic cohesion.

Under the Mughal dynasty, Indo-Muslim architecture changed even more because of the impact of the Rajput and Bengali architecture and that of some other Indian provinces.

The wise Emperor Akbar (1556-1605) was famous for his religious tolerance and evinced serious interest in all major Indian religions including Christianity. He had even created a sort of their synthesis called *Dīn-i-Ilāhī* (divine faith). During his time, secular architecture, in particular court buildings, assumed a special dimension, such as the wonderful city, Fathepur Sikrī, a new but short-lived capital of Akbar. It was built amazingly quickly – from 1569 to 1574. Homogenous in style, without any additions or alternations, it produces a great impression. In their forms and decorative details, all the buildings in many aspects differ from the orthodox Muslim aesthetics. A characteristic of the architecture encouraged by Akbar, this corresponded to his policy of getting closer to the Hindus, to his interest in painting and ancient Indian culture in general. In Fathepur Sikrī's architecture the combination of the old and new traditions, and national ideas of beauty regardless of the religion of builders, have been embodied more fully. Like in all Islamic countries, in India too, the majority of Muslims were local residents who embraced this new religion. It is no wonder, therefore that the expart craftsmen who, under Akbar, enjoyed greater freedom of artistic creation, succeeded in enriching secular architecture even with fine motifs of art and to give greater plasticity to details of buildings that was a manifestation of the "sculptural nature" and other traditions of pre-Muslim architecture. Round genuine sculpture was, naturally, impossible in those conditions but reliefs and thematical paintings are found there.

The five-storeyed court pavilion, Panch Maḥal, resembles in design a Buddhist monastery—*vihāra.* But even under Akbar, the Islamic ban of fine arts was strictly observed with regard to mosques, and striving for plasticity of details manifested itself in rather a restricted form.

One of the majestic entrances of *Jāmi 'Masjid* of 1572 called *Buland Darwāza* (Lofty Gate) is in fact a triumphal arch erected in commemoration of

Akbar's victorious expedition to Gujarat. In the general appearance of this huge building, one can see the influence of the Iranian architecture. However, the side loggias, the system of miniature domes and technique of decoration (stone inland with stone) are Indian. In Iran, it may be noted, the practice of facing with glazed tiles was widely spread.

In the vast yard of *Jāmi 'Masjid* there is an attractive tomb of Salīm Chishti (1573) built of white marble. Its outside walls of openwork (*jāli*), mosaic decoration of the floor, mother-of-pearl inlay of the canopy over the cenotaph and the whole exquisite ornamentation sparkling with mother-of-pearl, golden and colourful painting, have acurate geometrical forms. But the snak-shapped brackets of portico and cornice vividly convey the striving for plasticity, as an echo of pre-Islamic traditions. As it was customary in Indian ancient and mediaeval temple and court architecture, Salim Chishti's mausoleum stands on a postament, edges of the roof protruding like those of Hindū *chijja*. This tomb, in general, reflects the features of architecture of Mālwa and Gujarat.

The famous mausoleum, Tāj Maḥal, in the construction of which Muslims from India and other countries played leading role, employing architects and leading craftsmen, has an unique Indian appearance unmatched in any other Islamic country.

It reveals the best typical qualities of architecture of Shāh Jahān period. Though basically the mausoleum is a common centrical portal-dome type of Muslim tombs, it possesses a number of peculiar architectural features and artistic qualities. It has been built on a platform, like Hindu temples and palaces (for instance in Vijayanagar). Besides, owing to its position on the shores of the *Jamuna* river, it required a terrace (*kursi*). The height of the latter is 1.37 metres from the side of the garden and 9.6 metres, from the river side. The platform rises over the terrace by 5.5 metres. The height of the mausoleum proper—from the platform to the basis of the spire—is 57 metres and is almost equal to its width. The height of the dome is 24 metres, the distance from the ground to the top of the spire being 74 metres. Portal arches are 20 metres high, and the four minarets in the corners of the platform are 41.8 metres high. The proportions of the Taj are very simple—its projection represents a square with bevalled corners. Its four facades are absolutely similar, looking like a huge portal with a high lancet arch flanked by two large and deep lancet niches (one above the other) and similar niches are on the bevelled corners of the mausoleum. All this is crowned by a beautiful form of central dome of Iranian type. It is surrounded by four elegant small pavilions (*chahtrī*) with the cupolas of purely Indian form. This pental system which was used in India since ancient times, is called "*Panca Ratna*" (five jewels).

Like ancient Indian architecture, Tāj is connected with natural environment. However, before that, the Rajasthānī architecture, for instance, was subordinated to

a surrounding landscape, and even ancient caves became a part of nature. In the case of Tāj, the nature is amalgamated with the mausoleum in the form of artificial parks and gardens with water reservoirs and canals. These water reservoirs became an important part of the ensemble of buildings, especially near mausoleums of noblemen called *rauda*, which in fact is Tāj Maḥal. From the northern side, Tāj rises on the background of the sky as if directly from the water, but is bound to earth by well-planned garden. The reaction of the appearance of the mausoleum to atmospheric changes is specially interesting. Its carefully polished marble reflects sunlight in blindingly white colour. In various hours of the day, the shades of the marble change imperceptibly. When mid-day heat subsides, for a few minutes these appears a tender pinkish shade. Floating clouds cast airy shadows upon the mausoleum, like those on transparent waters. Running along the monument, they reveal tangibility and material nature of its forms. Huge portals and loggias, with their deep shadows, enhance this impression. In the full-moon light, Tāj Maḥal becomes an great enchanting sight as if made of greenish suffused moonlight, while the dome appears as hanging among stars. In such moments, indeed it seem lonely and sad, like the tomb of unforgetable Mumtāz Bēgum. As Swāmi Vivēkānanda said; "Press the marble with your fingers and you will see tears of Shāh Jahān over his beloved coming out of the stone. Like human emotions, Tāj Mahal lives, changing depending on the light. Taj appears human, it possesses feminine beauty and reflects mental qualities of Mumtāz".

There is an additional visual effect. Tāj has an ideal reflection in the central basin of the park. And this is not only example of Mughal or other architects who used sublime methods of applying reflection in water Sher Shāh Sūr's mausoleum in Sasārām (Bihār; 1540) is built on a tiny island in the middle of a water reservoir itself. When water ripples run in the reservoir, it seems as if the huge building is floating like a ship. Subtle play of chiarosco so skillfully employed in Tāj, diffused and refracted through sone screens, reflected sunlight in the inner premises of Gujarat Mosques, artistic illumination of sculpture revealing its forms and plasticity of details, methods of presenting atmospheric effects are an inalienable feature of the ancient Indian architecture and sculpture.

Individuality of Mausoleums became a typical feature of the Mughal architecture. Such is Akbar's tomb in Sikandrā (1613), *I'timād-ud-Dawlāh* tomb of the Chief Treasurer, in Agra (1628) the tomb of Mīrzā Ghiyāth Beg, Chief Minister of Jahāngīr, in Āgra (1628) and others.

The popularity of Tāj Maḥal depends also on the easiness of perception of its forms characterised not only by simplicity but also by the fact that they embody in an ideally harmonious, classical form, the main as well as the most typical and world famous features of religious architecture of Muslim countries of the East where the dome, portals with lancet arches and minarets constitute its essence. The

universality of Tāj's forms, as those of mausoleums, is expressed in a most regular and harmonious form.

There is an opinion that out of the best buildings in the world seven are the most famous: Parthenon in Athens; Mark Cathedral in Venice; St. Sofia Cathedral in Constantinopal; Reims Cathedral; Palace-castle Algambra in Granada; the Saint Basil Cathedral in Moscow; and Tāj Mahal in India.

SABZ-BURJ—AN ARCHITECTURAL REPRESENTATIVE OF CENTRAL ASIA IN DELHI

M. C. JOSHI

In the growth of the Indo-Islamic architecture much has been contributed by diverse elements of foreign origin. Of such elements, which are to be noticed in constructional techniques, the structural formats and decorative schemes of the Indo-Muslim buildings, seem to have been derived, directly or indirectly, from the structural traditions of Central Asia. Amongst the Indo-Islamic monuments, those bearing direct structural impact from Central Asia betray greater architectural conspicuity in their format than those of indirect inspiration. Possibly, the edifices of former category were produced by direct migrants, patrons, builders or architects, from various parts of Central Asia, while those of the latter one, by gradual adaptation through various intermediary sources.

In India, there are not many extant Indo-Islamic buildings suggesting direct Central Asian Architectural derivation in India, and a few of them in our view are located in Delhi and we propose to assess one of them from the structural point of view, viz, the Sabz-Burj.

Location and Name

To the west of Humāyūn's Tomb near Bū-Halīma's garden, right on the Mathura Road (New Delhi), stands a lofty and heavy structure called *Sabz-Burj* (green tower). The building, which is a tomb, derives its name from its tower-like appearance and the coloured tiles used on its exterior (especially the dome). Although it (Plate I) is in a fair state of preservation, much of its painted cut-plaster work and colourful tiled-decoration have pealed off Nevertheless, it is possible to visualise the richness of its original ornate character with the help of extant patches of paintings and enamel work. Structurally, the *Sabz-Burj* presents many interesting features connected with the early phase (pre-Akbarī) of the Mughal architecture. It appears that this monument was never studied properly, in spite of its conspicuous location; nor has it been dated in precise terms. The author of the *List of the Monuments of Delhi*[1], who made a detailed study of almost all the monuments of Delhi, refers to it merely as a Mughal building without even mentioning its outstanding traits; it is mentioned therein as the tomb of a saint.

Description

Built of dressed rubble and brick in lime mortar respectively in its lower and upper stages of construction, the *Sabz-Burj* bears a domed superstructure coated with stucco plaster and embellished with glazed tiles of various colours and

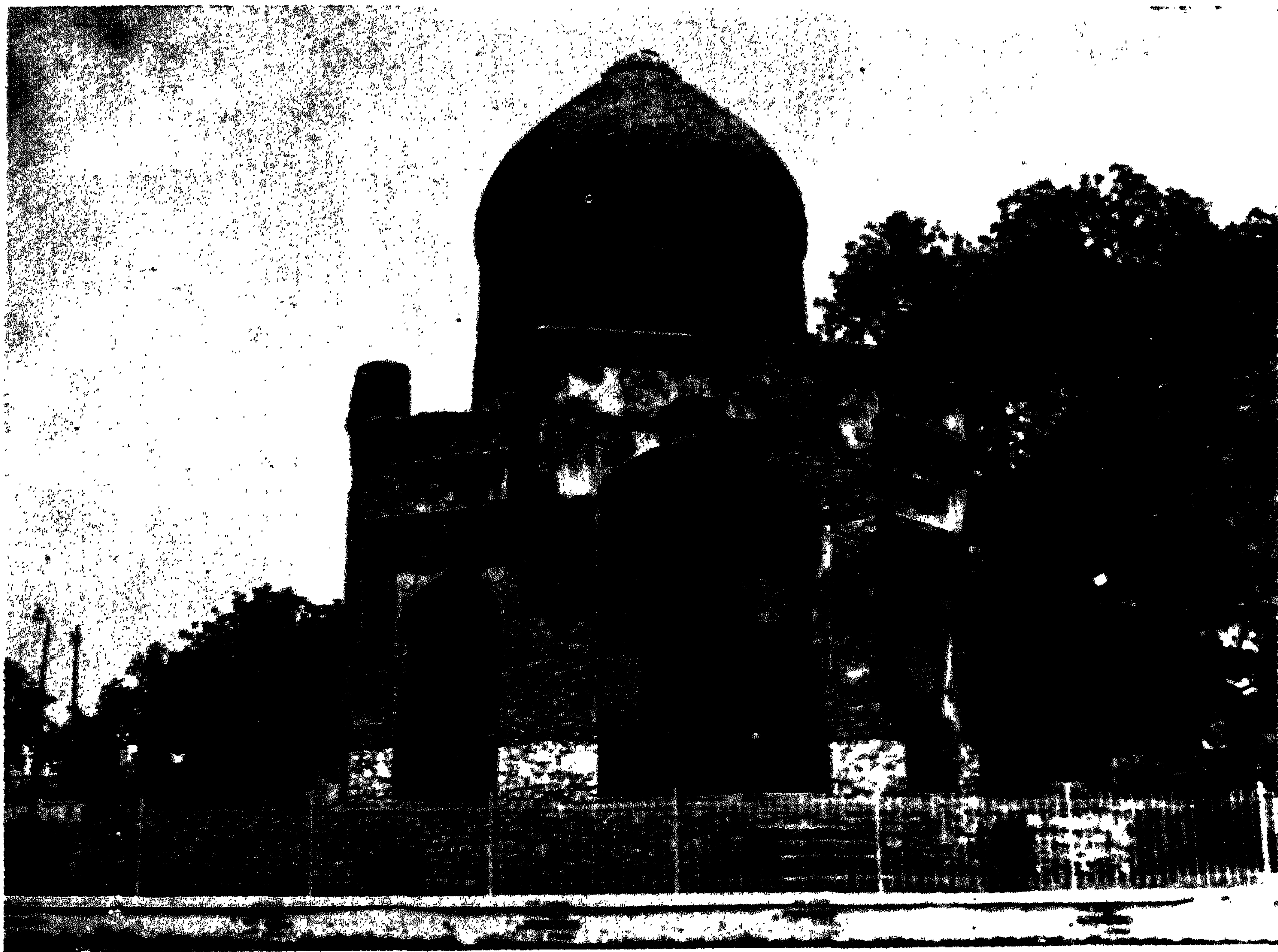


Plate I. Delhi, Sabz-Burj, general view
(Photograph, Copyright Archaeological Survey of India)

painted stencilled-designs (Plate II). It stands on a low octagonal platform (Fig. 1), and, perhaps, originally had a walled enclosure around it. On plan, the *Subz-Burj* is an irregular octagon (*muthamman-i-Baghdādi*) of four long and four short sides with a square mortuary chamber. Each of the four exterior sides (facing cardinal directions) of the tomb has within a frame an emphatic arch of Tudor type (four-centred) which contains in its interior a rectangular doorway superimposed by an arched-opening. The short sides of the building are also stressed with tall alcoves which are half-octagon in plan except at the south-eastern angle to accommodate flight steps lending to the top. Inside these alcoves can be observed traces of intricate arabesque and geometric (Plate III) designs in brilliant colours as cut-plaster work. The bosses on the spandrels, which are of circular form, were encrusted originally with thick tiled decoration, including sacred writings. The interior, comprising a single (8 m. square) chamber with the base of a grave in the centre, has a valted ceiling resting on arched walls and usual type of squinches.

The dominating aspect of its elevation, however, is represented by the upper dome rising from a high circular drum with faintly tapering sides. The dome



Plate II. Delhi, Sabz-Burj, interior (ground floor) domed martuary chamber (Photo, Copyright Archaeological Survey of India)

itself simulates a broad-based cone with an inverted lotus at the top. Traces of thick tile decoration are still visible on the dome and drum. The extant patches of glazed tiles contain decorative designs like foliated-oblongs and cruciforms in green and blue colours on a creamish base. Unlike the lower part of the structure, its dome and drum are built of relatively thin bricks of different sizes, which although not very well finished, look like the precursors of the *lakhorī* bricks, so commonly used in the Mughal buildings.

Nevertheless, it is the interior of the upper dome which preserves certain interesting marks in it indicating the technique of construction. The unfinished soffit surfaces of the dome and drum bear the traces of cross-walls showing a wheel-shaped plan with eight spokes which formed eight distinct compartments to support the domical superstructure while under construction. The cross-walls

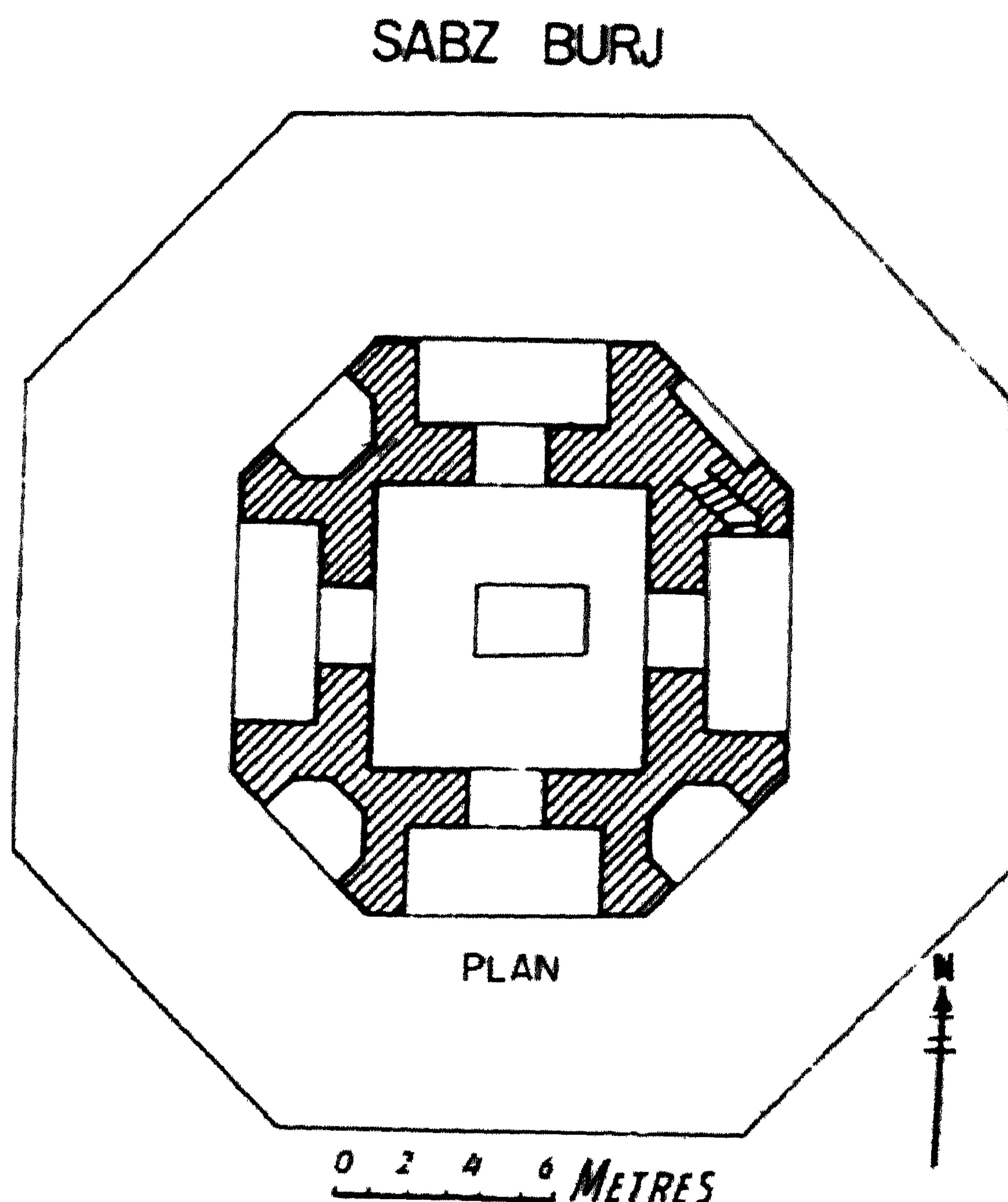


Fig. 1

were topped towards the apex of the dome by wooden planks. An almost intact and another damaged wooden beam can be still seen fixed on the underside of the dome (Plate IV). The cross-walls were dismantled after the construction of the dome was over, but the marks left by them on the wall-surface were perhaps never plastered (Plate V). The whole evidence thus provides an exact idea of the mode of centring for the construction of a dome during the Mughal period.

But, according to Sengupta[2], these cross-walls in upper dome were to serve as a permanent support because without them it was not possible for the dome to remain intact. He suggests this on the basis of some similar feature in Abū Naṣr Pārsā's mosque. Yet Sengupta's view cannot be accepted in view of the fact that upper dome of *Sabz-Burj* has survived through centuries even after the removal of these cross-walls.

It would thus be seen that the *Sabz-Burj* is a significant monument in many respects. Strictly, it has no pre-Mughal (Sultanate) Indo-Islamic feature except the inverted lotus at the top, for, there are no *Guldastās*, *Chhajjās*, or *Chhatrās*, although the presence of kiosks or *Chhatrās* around the dome must have added considerable grace to the composition.

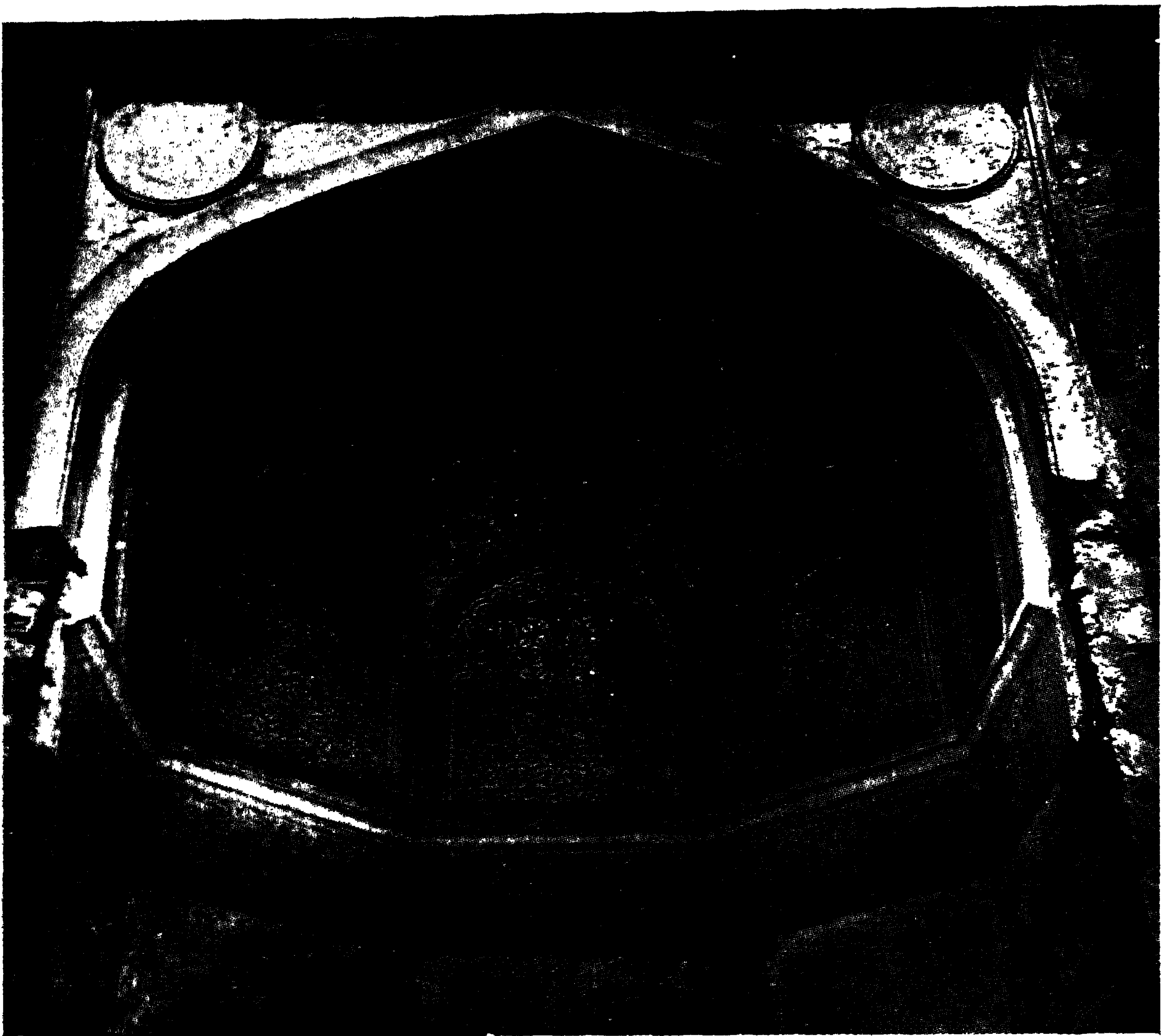


Plate III. Delhi, Sabz-Burj, decorated interior of the alcoves on the exterior comparable to ornale facade of Mosque & Tomb of Twiman Aqa (Shab Zinda complex), Samarqand (Photo, Copyright Archaeological Survey of India)

The tall drum and conical dome with a broad base decorative scheme of *Sabz-Burj* clearly suggest an affinity of this tomb with certain Tīmūrīd monuments of Bukhāra and Samarqand (e.g. Madrasa Mīr 'Arab at Bukhāra and several edifices of the fourteenth and fifteenth centuries inside Shāh Zinda comples at Samarqand), this type of the crowning component can also be regarded as a remote ancestor of the Shāhjahānī and later Mughal domes. Similarly, the irregular octagonal[3] plan and corresponding elevation with alcoves on all external sides indicates the genetic form (of foreign origin) of more complicated Mughal structure conceived as a Baghdādī-octagon like the tomb of Humāyūn and the Tāj.

The planners of the *Sabz-Burj* were probably guided by one main objective, that is to have a towering verticality for a medium-sized building. And the only

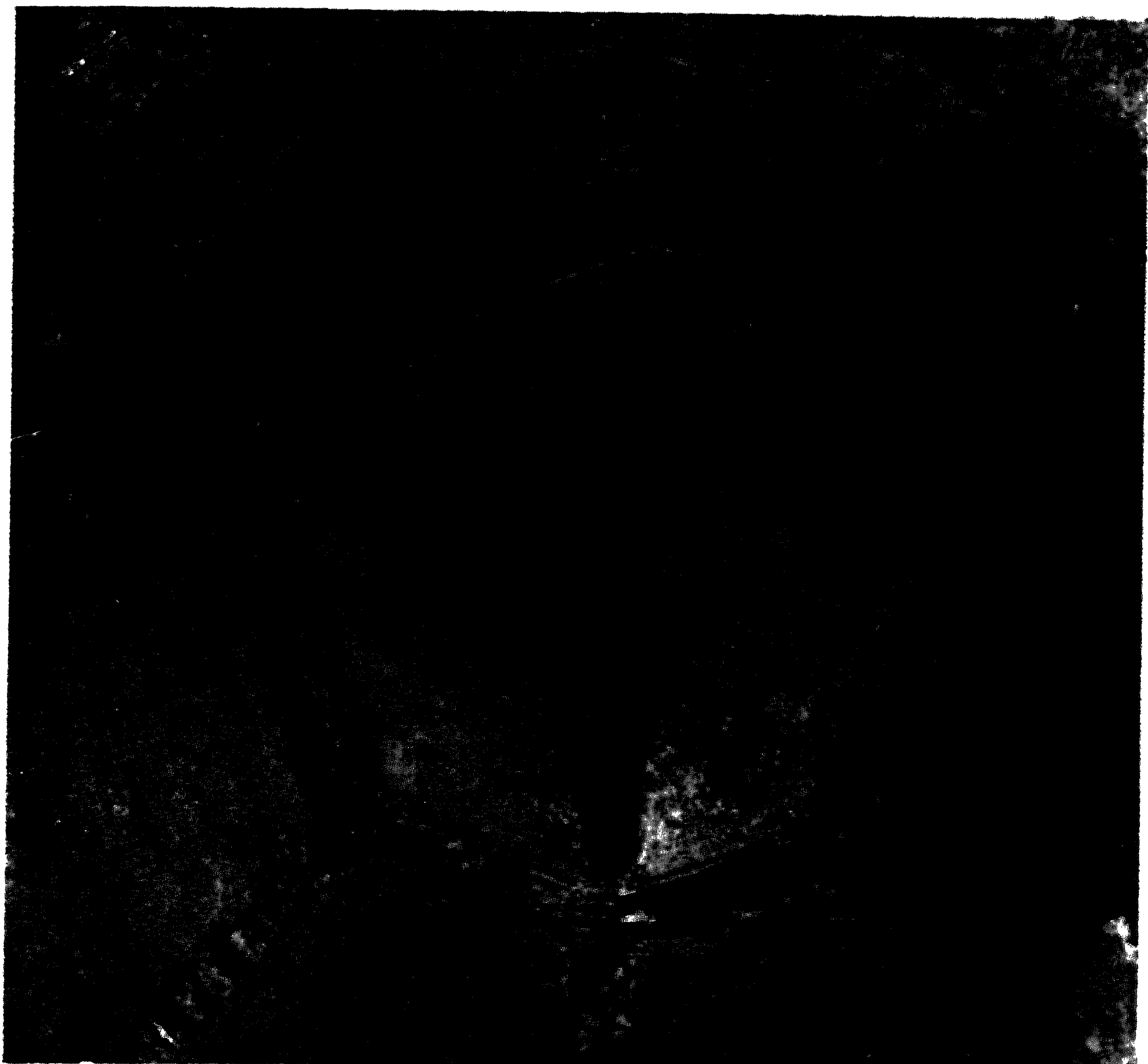


Plate IV. Delhi, Sabz-Burj, interior of the upper-dome-showing technique of construction)
(Photo, Copyright Archaeological Survey of India)

way to achieve this end was to have a double dome which necessitated the employment of multiple arches and alcoves in the walls for a proper distribution of weight and the use of irregular octagonal design to bind the angles of the inner square chamber with greater firmness. The use of brick in the construction of upper drum and dome was also perhaps done for lessening the weight of the superstructure, for, the builders had no experience of raising double domes of stone on such a structure[4] but they were well familiar with well grown Timurid structural tradition.

Date

The only other building similar to the *Sabz-Burj* in design and construction is *Nila-Gumbad,* a tomb located close by to the south-east of Humāyūn's tomb.

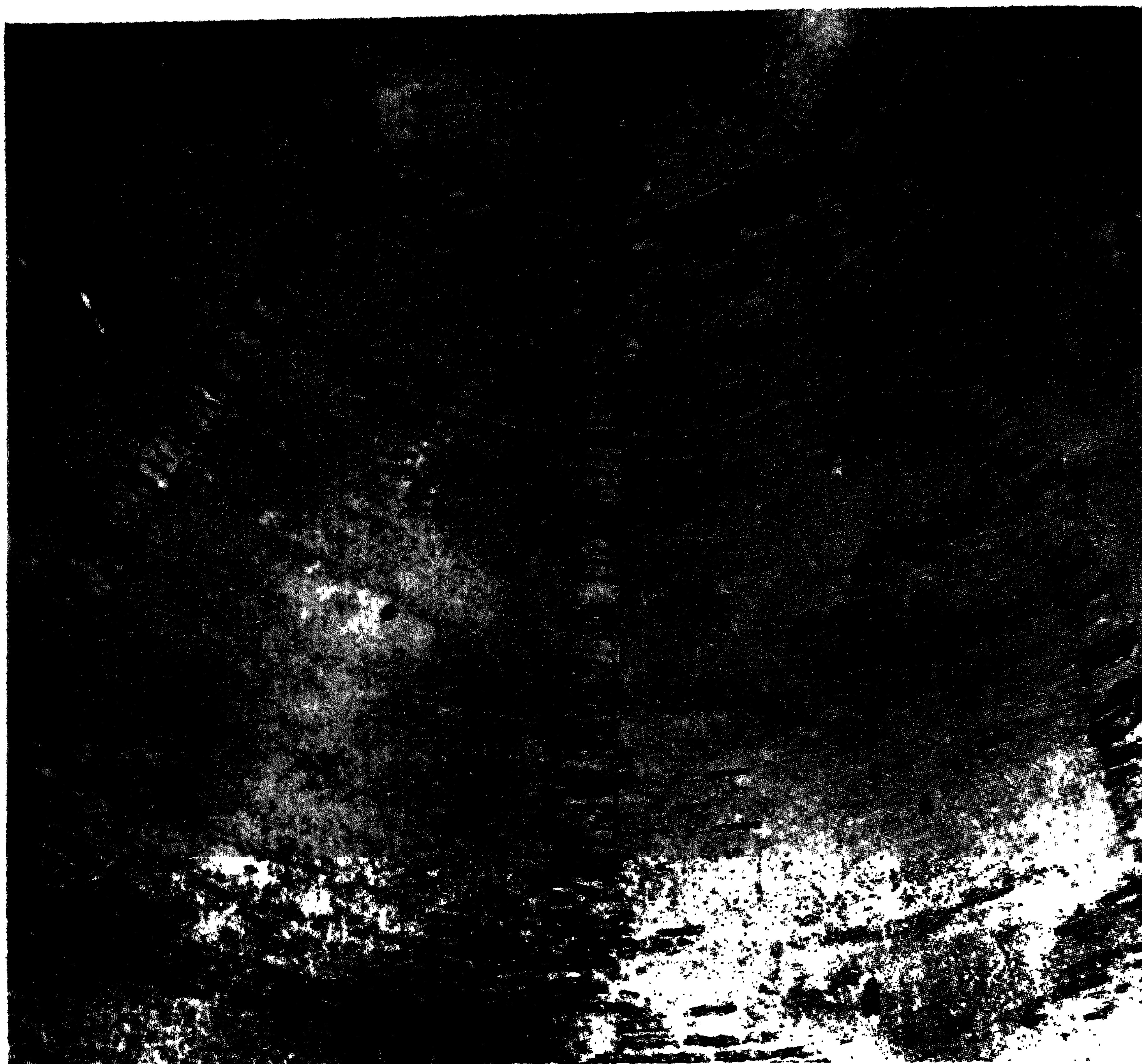


Plate V. Delhi, Sabz-Burj, soffit of the upper dome, side view, showing traces of cross-walls raised originally for the construction of dome as a support
(Photo, Copyright Archaeological Survey of India)

Most of the modern scholars have dated the *Nīlā-Gumbad* to the period of Jahāngīr following Sayyid Aḥmad Ḵhān; but a closet examination of its extent enclosure wall (Fig. 2), which was utilised without changing much of its structural character to serve as a part of the compound wall of Humāyūn's tomb, shows that the former (*Nīlā-Gumbad*) is of an earlier date than the tomb of Humayun.[5]

The decorative elements of *Sabz-Burj* and *Nīlā-Gumbad* illustrate occurrence of colour ornamentation executed through glazed tiles, out plaster work and ordinary paintings and a total absence of stone carvings of marble inlay and red sandstone veneer the characteristic features of the early Mughal building art.[6] The conspicuous pre-Mughal Indo-Islamic characteristics are, however, absent in both

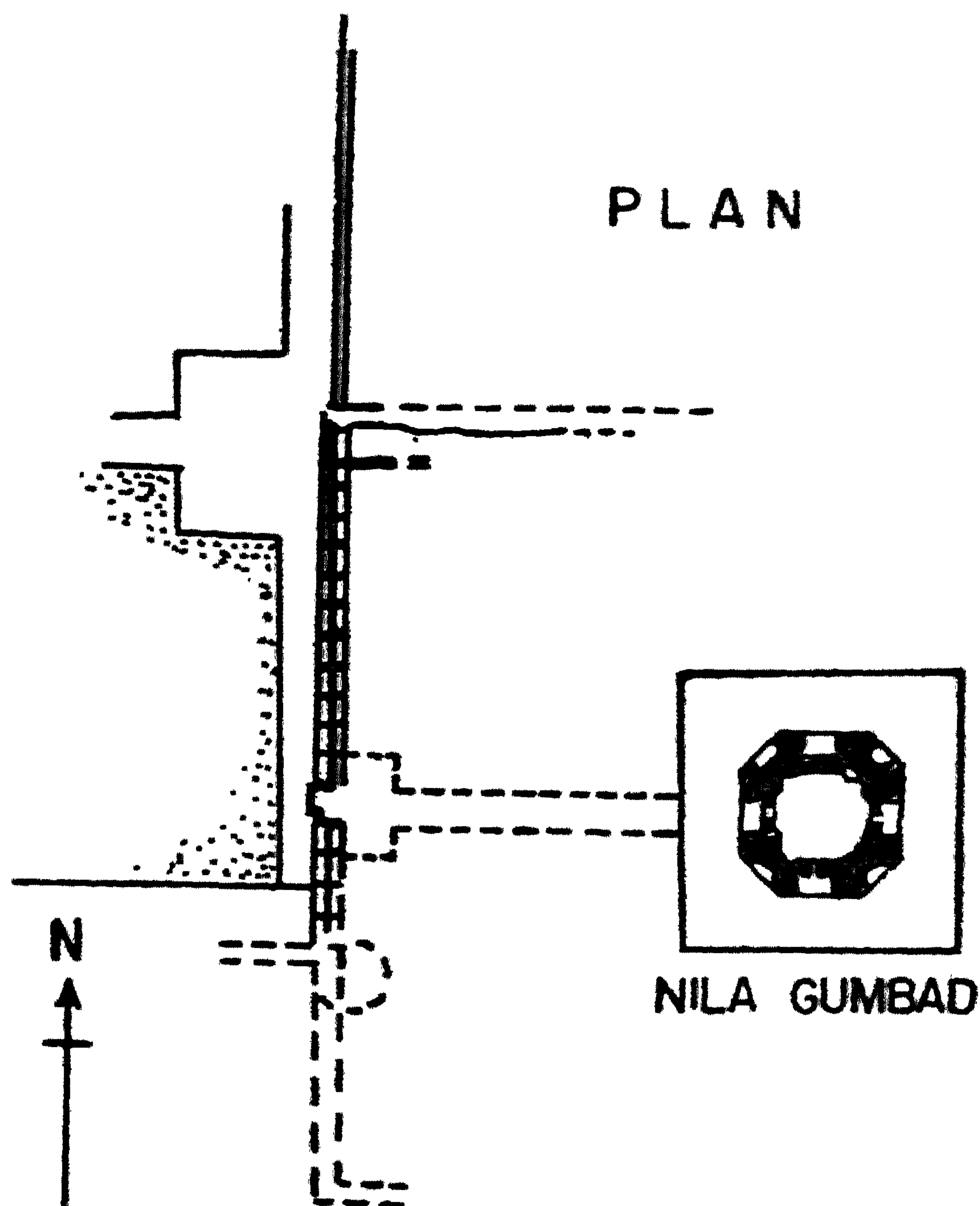


Fig. 2.

of them. Yet, in respect of structural manipulation, the *Nilā-Gumbad* has certain improvements over *Subz-Burj* especially in its balanced elevation with a proportionate drum and more carefully built staircase maintaining the symmetrical arrangements of alcoves on the exterior. Hence, the *Nilā-Gumbad* appears to be of a later date than the *Sabz-Burj*, even if the former was built immediately before the tomb of Humāyūn was planned, the latter must have been raised somewhat earlier to that.

As it was impossible to think of the construction of such buildings of pure Tīmūrid character during the period of Humāyūn's exile, the *Subz-Burj* seems to have been built within the first phase of Humāyūn's reign in India, i.e. between 1530 and 1540 A.D. Thus it is the earliest available specimen of the Tīmūrid architecture extant in India and also the first edifice with an irregular octagonal plan with double dome—the principal features which serve as the main source of the design of Humāyūn's Tomb and the great Tāj-Maḥal.

References

1. *List of Muhammadan and Hindu Monuments* (Delhi Province), II (Calcutta, 1919), p. 139.

2. Sengupta, R. : *The Tīmūrid Mosque at Balkh in Afghanistan and Development of Mughal Domes in India, Purāttava*, No. 9 (1977-78), pp. 57-63.

3. The earliest appearance of the irregular octagonal design amongst the Indo-Islamic monuments can be noticed in the lofty tower of the *Bijai-Mandal* (Tughlaw period) within the city of *Jahanpanāh*, Delhi. But as a regular structural plan the octagon of four long and four short sides was mainly used by the Mughals.

4. The earliest Mughal tomb with stone built upper and lower domes is probably the *Afsarwālā Gumbad* in Delhi, dated about 1566-67.

5. Naqvi, S. A. A. : *Delhi Humāyūn's Tomb and Adjacent Buildings* (Calcutta, 1947), p. 13.

6. The use of red sandstone with or without marble strips as encasing material is a feature of some Mamlūk Khalji as well as a few Tughlaw monuments, but in most of late Sultnāte buildings the employment of thick plaster over the rubble walls attained greater popularity. Mughals, who were only familiar with the glazed ornamentation, seem to have started finishing their buildings with red sandstone veneer with or without mosaic patterns not before Humāyūn returned from Iran in 1555. The red sandstone facing on the gates of *Purānā Qilā*, *Sher-Mandal* and *Qilā-i-Kuhna mosque*, therefore, appears to be a work of the last days of Humāyūn or of the early period of Akbar.

FROM THE INDIAN STŪPA TO THE MONGOLIAN SUBURGAN

V. N. TKACHEV

"...Various parts of plant originate from not a quite analogous organ which, remaining basically the same, is modified and changes by way of progressive development".

J. W. Goethe, "Essay on Metamorphosis of Plants", *Selected Philosophical Works*. Moscow, 1964, p. 32.

Stūpa (meaning in Sanskrit a heap of earth and stones) is the oldest genotype of a religious edifice. In India, and in the countries that derived elements from the Buddhist culture, a pile of earth or stones in a sacred site gave rise to: (i) a whole family of memorial structures intended for "exterior" worship rites and (ii) an extensive typology of temples, i.e., religious edifices designated primarily for enactment of the rites in the "interior".

Division of objects of the religious architecture into groups and categories is most often justified by interests in research on processes of interaction of earlier and later modifications of a single form, the emergence of which is separated by such great distances and lapse of time that the modifications are absolutely unlike and make an impression of being heterogenous. Indeed, it would appear that is nothing in common between the devotional *yurtas* of nomads and Roman Pantheon.

However, in considering intermediate key stages, we can observe that the *stūpa* and temple are integrated into a single chain of architectural morphogenesis despite radical distinctions of principles in their spatial organization.

The fact of their belonging to this chain is illustrated by the overwhelming majority of the Indian, or more precisely, Budhist architectural memorials.

The chronology of their erection follows the logic of development of sacral ceremonies, and of the partinent functional transformations of the ritual space.

Emergence of a temple may be roughly visualized as follows: Initially a sacral site on the territory is marked in relation to some reference point, i.e., a pillar, a stone, a pile, a tree, a mountain peak or a spring near which the rites of worship of local deities are conducted. Thereupon, the reference point as such becomes an object of worship, and this stimulates development of its forms. Going

around the circle serves as the basis for rites of primary worship that emerge naturally because of simplicity and the cyclic of the magic act addressed to an inanimate sacral object. Even at the early stages of endowing spirits with the image of a human being, worship rites for them continued to be based on the concentric patterns, viz., the idol would be in the centre, while the rite would be performed around it which evidences that the ancestral and tribal intercourse was not yet socially hierarchial.

Pradakṣiṇā is included into the architectural space as a corridor or as a route of circular movement, and can be distinguished by other architectural features (a row of columns). Thus the object of worship acquires a visible contour, and the functional and spatial conjuction of a relic with its veneration (or with other magic rites) from, in this way, a temple.

More complicated civilian and class differentiation within the society and a multiple procedure for drafting protocols of receptions offered by sovereigns led to long drawn rituals near the sacral object performed in several stages. Sequence of ceremonies began to play the most important role: the spatial distance from the entry to the relic became longer, whereas the entry, interpreted as the boundary between the sacred space and the secular world, could be far beyond the confines of the temple proper. Thus temple complexes were formed whose lay-out was based on the longitudinal-axial composition. The ceremony of going around along the circuit remains to be the apogee of the ritual, but spatially it is reduced to the minimum, and only sanctified persons of the highest rank are admitted to the ceremony. But it was not every where so. In Mongolia (19th century A.D.) capacious circling processions not only around the sacred object, but also around monastery settlements, constituted the essence of religious festivities. Moreover, the desire to reside within the "chalk circle" brought about specific effects on town-planning, in sofar as the density and configuration of the town lay-out were concerned.

Transformation of the Indian *stūpa* into a temple proceeded, generally according to the above described dynamic scheme, but ethnographic and regional specific features in the cultural development of India proper, and in the countries that adopted the Buddhist religion, must certainly be taken into account.

The most important stages in the shaping of the *stūpa* structure, and the role that they played in the architectural composition are as follows:

(i) Transformation of the dome into the pillar-like unit with the upward trend;

(ii) Equalization of the sacral significance of the *stūpa* as symbolic Buddha with his sculptural image;

(iii) Canonization of the *stūpa* architecture in conformity with cosmogenic concepts of Buddhism, and its application as a key component for lay-out compositions of the mandala type;

(iv) Cumulation of temple functions, envisaging the inner space for performing religious rites; and

(v) Elaboration of decorative components of the architecture and kinds of the temple outfit.

I

The change-over from immense deaf bulks of barrows of conical and semi-spherical shape to vertical contours in a normal regularity in the development of an architectural form. Vertical volume is more impressive in sofar as its visual quality is concerned. Its is more intelligible in terms of scale juxtaposition since pyramidal or semi-spherical shapes are less amenable to such comparison. The vertical volume allows a larger amount of information to be visually surveyed (sculpture. paintings, symbolic items). It's great importance is, of course, a lesser labour consumption, and cutting off of inert material. When the dome acquires superstructures, it looses its former main significance, and is considered as a stereobate (Fig. 1).

And, finally, our architectural interpretation of the Buddhist belief that the universe is arranged in tiers, called for lengthening the *stūpa's* height. Initially the dome was raised on a cylindrical or square foundation and later, it looked a parabolic, bell-shaped form, or that of an everturned truncated cone (Figs, 2, 3, 4, 5, 6, 7). Coincidentally, in accordance with tectonic specification, the stūpa's massif was differentiated as the base, *bumba* and crown (spire).

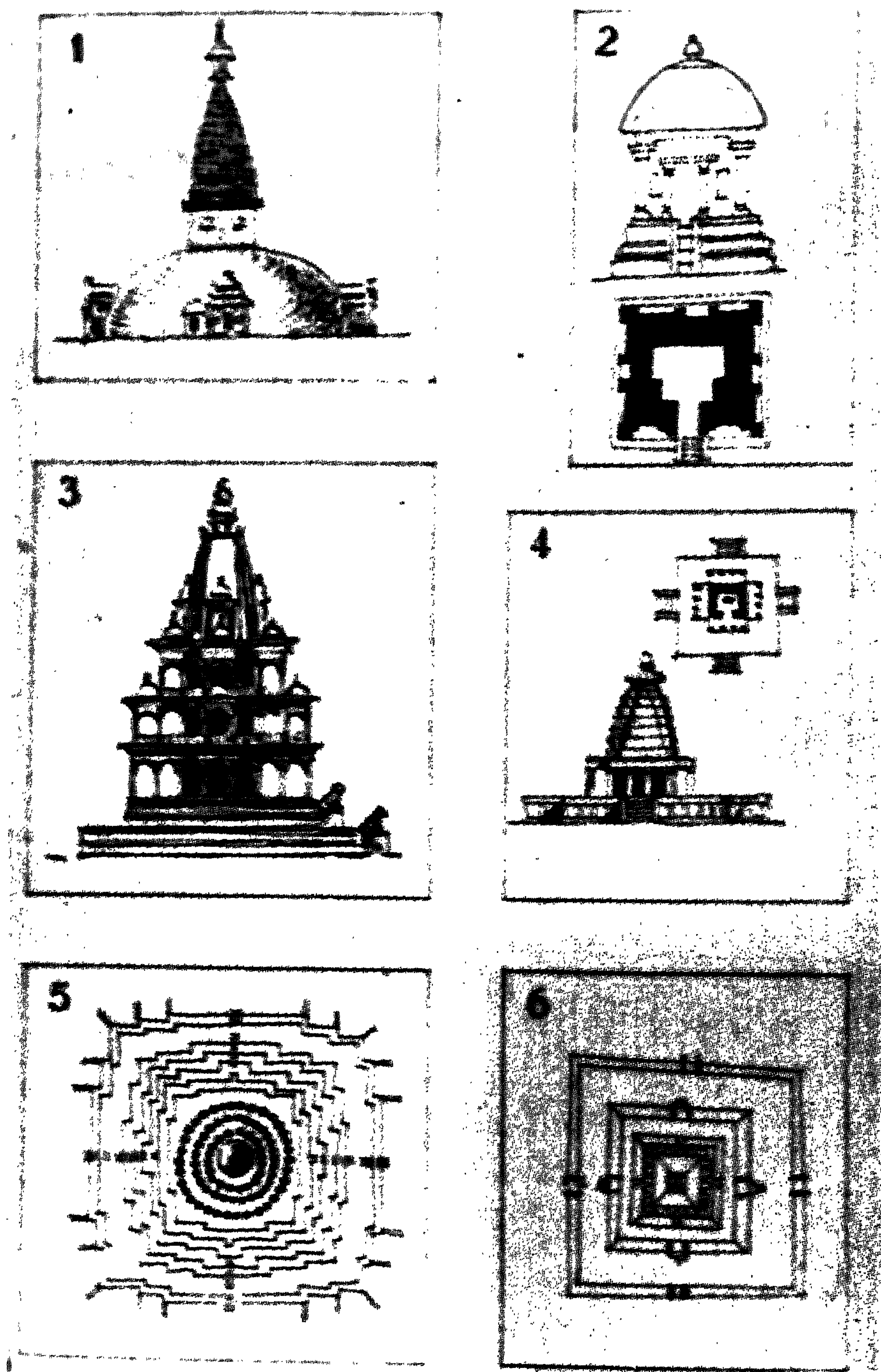
II

Sculptural images of the Buddha began to rival, in a certain sense, with the earlier accepted *stūpa* symbols signifying the Buddhist moran and philosophical ideals.[1]

In the architecture of religious edifices, the Buddhist's sculpture or *stūpa* may be accentuated or combined in various positional variants, viz., the sculpture in the niche of the *stūpa* placed in the temple; religious edifice in the form of a big statue of the Buddha, the internal chamber of which is filled with relics in *stūpa* and temple models; the *stūpa* on the head of a deity's sculpture (*Maitrei*).

Inclusion of a minute temples (Bodh-Suburgan at Erdene-Zuu, Mongolia, Fig. 19) in the composition of the suburgans (Mongolian *stūpa*).

A characteristic of the religious architecture practice ("mutual incorporation") of typologically differing architectural objects. produces curious examples



Figs. 1—6. 1. Stūpa Svayambunatha, : Katmandu, Nepal. 3rd century B.C. 2. Ratha Draupadi: Mamallapuram, India 7th century. 3. Krishna Mandir Temple : Lalitpur, Nepal, 13 century. 4. Daśavatāra Temple : Deogarh, India, 6th century. 5. Borobudur : Central Java. 8th century. 6. That-Luang Temples : Ventiyan, Laos, 16th century.

of fixation, in the same building, of several morphogenic stages. Some of them, in particular, the history of construction of the memorial over the ashes of Tsonkhava, have been described by G.I. Tsybikov.[2]

It should be noted that the religious significance of the Buddha statue or *stūpa* determined the interpretation of temples in which they are stationed as reli-

quaries. The oldest and the biggest temple at *Lhasa* is called Big Chzhu, i.e., the statue of the Buddha. The oldest ensemble of Mongolia bears the name of Gurvan-Zuu (translated as "three sacred statues of the Buddha").

III

Quite a number of researches deal with the symbolism of *stūpa* and kindred religious edifices in countries of the Buddhist world. *Stūpa* as an object and component of architectural compositions, has been inadequately studied as many scientists note. In this case, two aspects are important:

(i) Tectonic and artistic structure of the *stūpa* proper; and

(ii) Lay-out compositions in which, the *stūpa* plays the central or auxiliary role.

Being vertically tripartite, the *stūpa* illustrates the Buddhist concept of the universe. The stepped foundation corresponds to the third, lowest world where the spirit imbued with the matter is destined to relate for ever within the circle of sufferings (*samsara*). The second world (symbolized by *bumba*) is the precinct of Buddha's activity conducive to the riddance of spirit from bonds of the matter. Finally the first world symbolized by the spire is the seat of the spiritual principle—the perfect void (*sunyata*) i.e. *Nirvāna*.[3]

The spire, in its details viz., subdivision into rings, introduction of the umbrella ("*svayambakha*", Adi-Buddha symbol) and other components is associated with the development of "applied" aspect of *Bodhisattva* and apology of the "High Way".[4]

In lay-out compositions that follow the *maṇḍala* type and reproduce, in addition the Buddhist concepts of the universe (in other words, geography of the Earth), the *stūpa* embodies the *Sumeru* mountain, the highest point of the planet (the third world) where among 33 *tengrias* and genii *Hormusda* also abide.[5] (Figs 5, 6).

Thus, the symbolism of vertical divisions of the *stūpa* and its symbolic role in lay-out compositions belong to different levels, and are not necessarily conjoint.

IV

When Buddhism was waning in India and the erection of stupas was discontinued, morphological achievements in erection of buildings of this type were not entirely erased. Like metamorphosed pyramids in the epoch of the Middle Kingdom in Egypt, the *stūpa* in the modified form became a crowning part and the nucleus in temple structures.

As a "casing" for relics, the *stūpa* in the rapidly progressing architecture of India, was replaced by a form which was more closely fitting in respect of the

anthropomorphic objects of worship, viz., a residence for deity the form of which, as it is easy to understand, arose from other sources—the architecture of national dwellings. In such a manner, the functional and spatial correspondence, i e., relic case-exterior worship rite, turned into the correspondence, of the deity-temple, in the form of house-rituals (internal and external) divided into stages.

The freedom of operating with positional arrangement of form-objects inherent in religious architecture, enables to combine in the one spatial plot the *stūpa* with the temple edifice like, let us say, in the Krishna Mandir Temple (Lalitpur, Nepal), where the elongate massif of the *stūpa* is surrounded by three tiers or galleries (Fig. 3).

It is exactly such combination of froms that gave, in our opinon, impetus to emergence of many tiered buildings like the *stūpas* in Middle Asia[6] and pagodas in China; over there a well-pronounced formative factor turned to be, as L.N. Voronin reports, landscape surounding: "...countries with low relief are especially prone to undertake erection of high towers, while mountainous localities are less stimulative in this respect.[7]

V

Adornment of constructively tectonic components and the modelling of structures[8] maintain also a regularity of architectural morphogenesis. Noteworthy of the religious architecture is the concurrent presence of several scale levels of the spatial organization, as well as in the organization of furnishing for the building. Hence for example, the temple in the architectural ensemble is interpreted as a part of the lay-out model of the universe; in its turn, the temple is also formed as an independent and complete symbol of the universe; the altar composition is laid out in conformity with the same complete cosmogonic scheme; the temple outfit includes *maṇḍala*, and the donation tray with the representation of the Budhhist universe (bi-or tri-dimensional); for symbolizing *maṇḍala*, clay plaques might be laid on the tray.

Buddhism in the Lamaist version was rooted in Mongolian nomadic locations by the end of the 16th century, A.D. But, it expanded in Middle and Central Asia as far back as the 3rd century B.C.[9] Nomads came to know this religion in cours of cultural contacts with the settled population in other states-Bactria, Gandhara and Kashmir. The pulsating process of the rise and fall of nomadic states Munnu, Sianbi, Toba, Jujans, Turks, Higurs, Chi-tan and Mongols of the 13th century A.D., demonstrates the attempts of adapting Buddhism to the role of the state religion.[10]

Buddhist dogmas as well as ethical and philosophical norms penetrated inconspicuously into the social psychology of the nomadic milieu, preparing it for

conversion to a new religion, while on the other hand, Buddhism itself derived some features of the local cults.[11]

The "expertiment" of introduction of Buddhism in to the nomadic steppe lasted for several hundred years and was materially supported by erection of temples and monasteries as evidenced by chronicles. Therefore, there is no reason to date the initiation of the religious architecture (stationary) in Mongolia to the 16th century A.D. But this chronological problem might be reasonably tackled in another aspect.

Late in the 16th century, the period when Lamaism was proclaimed to be the official religion in Mongolia, the centres that contributed, from time to time, to renewal of construction of monasteries were localed beyond the nomadic country, viz., in India, Eastern, Turkestan, Tibet and China. And only in the 17th century A.D. Mongolia began to gain its own experience in capital construction, in forming architectural traditions, that took into account the architectural achievements of the nomadic people. What is more the context of these traditions implicated the custom of erecting the oldest religious structures of nomads, i.e., *obo*.

As a means of fixation of the sacral territory *obo* might have ben built of various material; or, in general, they could be a creation of nature, namely, a hut or a fancifully shaped tree in the *taiga* zone, a stone pile in the steppe latitudes, or a Haloxylon bush in Gobi.

Being the most archaic religious structure, *obo* was the bearer of the most profound ethnical and religious notions of nomads, and an obligatory detail of the *shamans* professional milieu. Despite the decisive character of the Altan-phan Code[12] which proclaimed Lamaism as the only religion of the Mongols, it failed to erase completely the *obo* cult since its source was the very essence of the nomadic manner of life; but, as a religious structure, *obo* gradually[13] acquired the spatial form of a complex that mirred the Buddhist cosmology.

It was the stone *obos* that became objects of the subsequent architectural development (Fig. 12); they provided a broader opportunity for tectonic research being, in addition (on an average), the main constructional material in Mongolia, that for along time it was securely linked with the magic of erection and veneration rites of *obo*. As the architectural genotype, the Lamaistic, *obo* imprinted also forms of the oldest memorial and funerary structure of the steppes-*kereksur*—which, by means of their flat stone arrays, replicated *maṇḍala* ideas fixed in *obo* (Fig. 24).

One cannot say that the forms of the Indian *stūpa* that passed through the filters of the Tibetan architecture, superimposed the *obo*; they rather stood side by

side and were coexistent, not replacing each other. Each of them represented its own level of religion, but it did not encumber their coincidence in the compositional unity (Fig. 25).

The Indian *stūpa* was the first ever structure on the route of the Buddhist advancement to the north, to Middle and Central Asia, and in each country their own forms of *stūpa* were developed as well as names thereof.

Bearing in mind the contributions to the Mongolian culture we shall turn our attention (within the ambit of the subject) to Eastern Turkestan, China and Tibet.

In the years preceding the foundation of Mongolian Empire in Eastern Turkestan, the Uigurs residing on the border with nomadic steppes founded their own state after moving from Okhon in the 9th century A.D. The expedition led by S.F. Oldenburg investigated memorials of the Uigur religious architecture, including several complexes of *Caitya* (local stūpa) of which the most interesting was *caitya* in the form of the immense clay sculpture of the Buddha.[14]

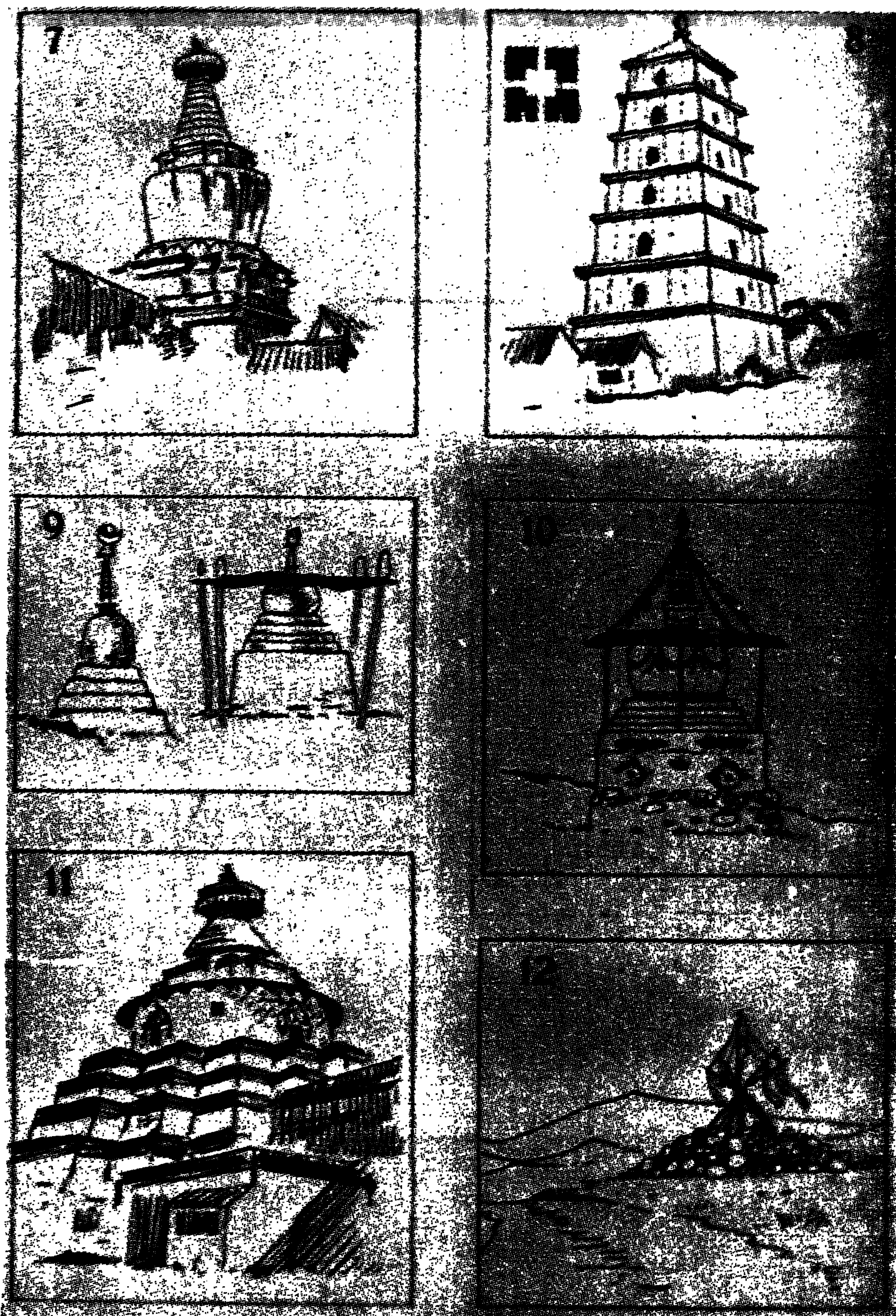
Getum, the Armenian king who visited Karakorum in 1254 A.D. mentions gigantic statues of *Sākyamunī* and *Maitreī* worshipped by Mongols.[15] As it seems there is a direct association between these statues and Uigur *caitya* that corroborates the fact of extensive building activity of the Uigurs in the Mongolian Empire.

In China, the Indian *stūpa* was transformed into the *pagoda* (Fig. 8). The notion of immortality that dominated sovereigns of the Heavenly Empire brought forth the cult of veneration of heavenly residents for mystic contacts with whom the tall tower-beacons were erected.[16] These were ranged, by the way, from the Buddhist symbolism. At the same time, the chronicles point to non-religious destination of *pagodas* that serve as beacons, watch-towers and observatories.[17]

The *Chi-tan*, who were the immediate predecessors of the Mongols as masters of the steppe, also built towers installing them as landmarks in the localities favoured for camping by migrating emperors, as reference marks of future capitals.[18] Chinese and Chi-tans towers exemplify the deviation from their initial functions towards utilitarian purposes. However, both the Chinese and Chi-tan erected *stūpas* proper, even of iron[19] that functioned as Buddhist reliquaries.

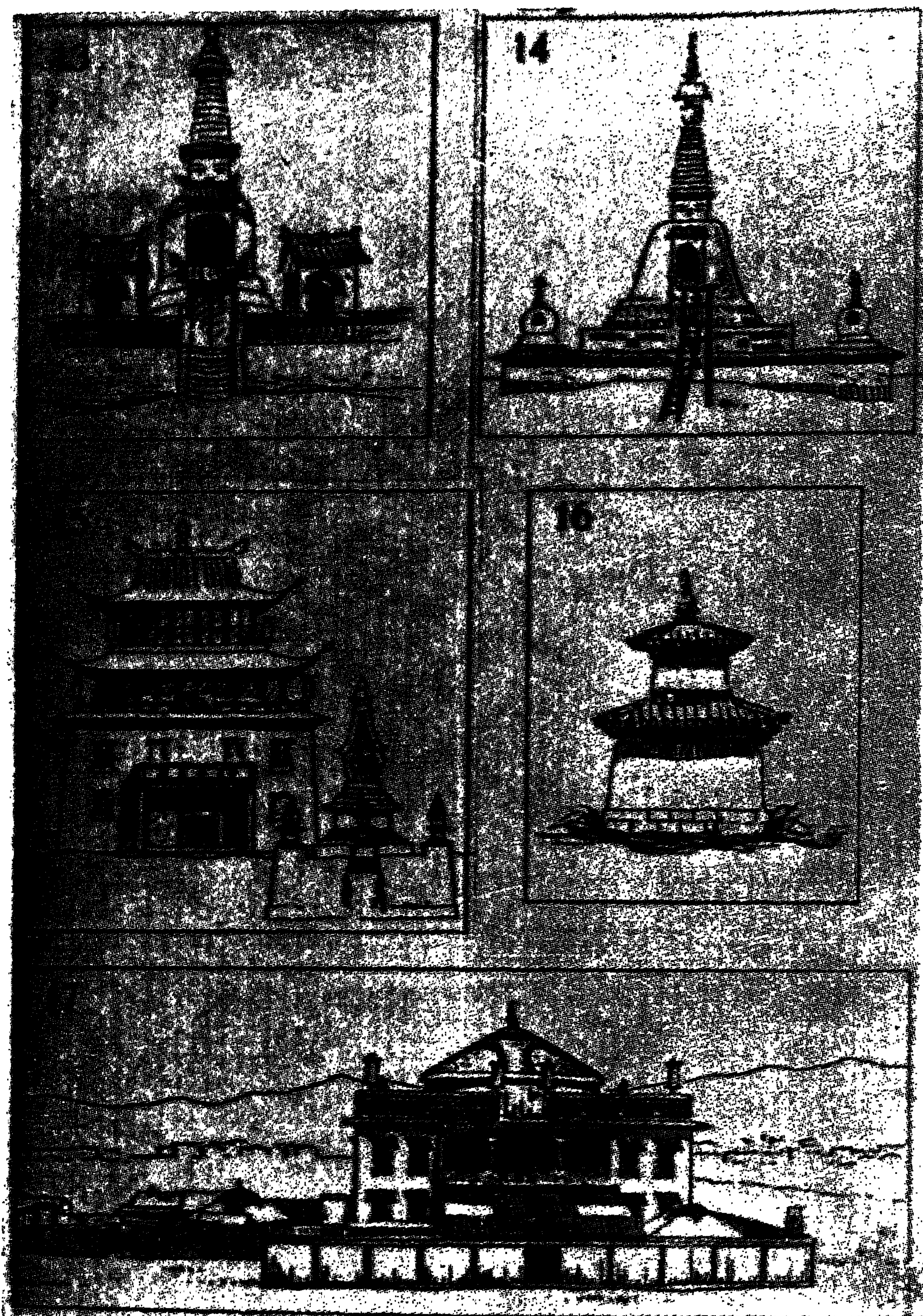
On the territory of the present-day Mongolia, the Chi-tan build (near the so-called Bars Khote) *pagodas* whose formas H. Perlee,[20] finds closely resembles the Indian ones. And except for colourful description of the Sin-Yuan-Ge, no *pagodas* in Mongolia are mentioned. What could be the reason ?

Changez Kḫān was still looking for the elexir of immortality provided by a Chinese wise man when his grandson Khublai was already implanting Buddhism



Figs. 7—12. 7. Beita Pagoda : Myaoensy Monastery, Peking, China, 1271. 8. Dayanta Pagoda : Tsyensy Monastery, Chanan, China. 652. 9. Tibetan Chortens. 10. Chorten of a Buddhist Monastery at Mustang. 11. Chorten-goman : Gyantze Monastery, Tibet, 15th century. 12. Mongolian Obo : General View.

of the Tibetan variety. During his life time, there was erected in Peking a Tibetan *suburgan* (Fig. 9). In the light of the Tibetan Buddhist theory, heavenly residents needed no towers. Under Yuans who transferred centers of the economic, political and cultural life into China and who gave much attention towards creating a culture center at U-Tai-Shan[21], the construction work in Mongolia as such in general declined. This is evidenccd by an order of Khublai banning construction of *pagodās* there.



Figs. 13—17. 13. Suburgan Zhorom-Khashar : Gandan, Urga, Mongolia. 14. Suburgans of Ikh-Tamiryn Khuree Monastery : Mongolia. 15. Megzhid-Zhanraiseg Temple : Gandan, Urga, Mongolia. 1913. 16. Tomb of Abatai-Khān : Erdene-zuu Monastery, Mongolia, 17th century. 17. Devotion Chamber Maidari at Zuun-Khuree : Urga, Mongolia, 19th century.

The historicaly stemmed fast and stable ties between Mongolia and Tibet defined a broad-scale and effectiveness of the religious propaganda emanating from the "snow country" to nomadic steppes of Central Asia; architectural features were also transferred, though under conditions of traditional nomadic life. there was no ground for promotion, for example, of erection of Tibetan stone temples.

The architecture of the Tibetan *Chorten* is indeed meagre (Fig. 9). It acquired a strong cubical sub-struction and this provided an opportunity to build passage *chortens*. Considering the multitude of piligrims travelling to famous Tibetan monasteries and the necessity to establish special routes for circular movements around the sanctuaries, this architectural finding was very useful and the purgative function was assigned to it.

Many *chortens*, particularly in zones of heavy snowfalls, were equipped with the roof-covering *bumba*. Employment of curtains, ribbons with inscribed prayers, small flags as items of the "exterior" architechtural design, characteristic of Tibet, Nepal, Mustang and Bhutan, influenced the ornamentation of the *chorten* (Fig. 10). To its top, falling ribbons were attached as well as flags supported by guys securing stability of the spire.

Broad ribbons of the spire and the Mongolian *Khadak* (a long piece of cloth intended for presenting donations) reminiscent of them may be semantically related to the act of laying the shroud referred to by A. van Gennep.[22] A variant of explanation of the original destination of *darzok* was inadvertently prompted when this author caught sight of a *yurta* fenced off at some distance with a row of small flags that ought to scare wolves.

Ascetic form of the *chorten* was compensated by a device providing a niche-reliquary ornamented by a fine relief imitating the shroud.

Colouration was determined by a position of the *chorten* in the religious ensemble with reference to the cardinal points. Tibetan Buddhists assumed that the Sumeru mountain, the presumed centre of the Universe, identified their country. The sacred light of the faith spreading hence throughout the world, emanated green rays northwards, white rays eastwards etc.[23] Four *chortens* of the the *Sam-Yas* monaster are dyed in accordance with this colour indication.[24] The cubiform support under the spire of the *chorten*, with eyes of the Buddha on all four sides, also implicates the idea of faith propagation (Figs. 1, 10, 13, 14).

The unique example of the *chorten-Goman* suggests that, in the Tibetan religious architecture, the process of transformation of the *stūpa* into the temple was underway being deeply national in form.

Forms of the first Lamaist *suburgans* were imported into Mongolia together with the teaching of *Tsonkhava* from Tibet. Mongolian *suburgans* are also raised on a solid cubiform foundation, and their main constituents are tri-partite; the spire has 13 rings and the *svayambhu* (here *soembo*). Ribbons of the spire are rarely encountered in nature, but nearly always on the painted and sculptured representations of *suburgans* (Fig. 18). The *bumba* whose form as a rule is the

everturned truncated cone, rather "dry" in profile, exhibits, instead of the relic niche, an ornamental board of consecration set up on the southern side. The inner chamber of the *bumba* was meant for deposition of sacral objects which, in this case, were symbolic remains of Sākyamuni or of prominent figures of the Lamaist congregation. In the latter base, these might be statuettes of imitations of *suburgans* made of clay mixed with ashes of the deceased, or a *sharil*—mummies in the sitting position.

Suburgans erected in memory of particularly important events or in keeping a vow were outfitted with the temple paraphernalia including sculptured and painted burhans, books and texts of prayers.

Suburgans in Mongolia were dyed only white. Neither in natural surrounding nor in the historical data can we find examples of another colouration, although, in principle, there were no contra indications to it. Only the consecration board was coloured in the light blue background (by analogy with the *maṇḍala* center) the edge of which was a bread gilded frame work (more often coloured with the yellow oil paint).

Mongolian *suburgans* derived from *obo*, the function of landmarks in the steppe wilderness. They let the nomads know of nearing a monastery or another religious object. In such a case, white colouration was most reasonable.

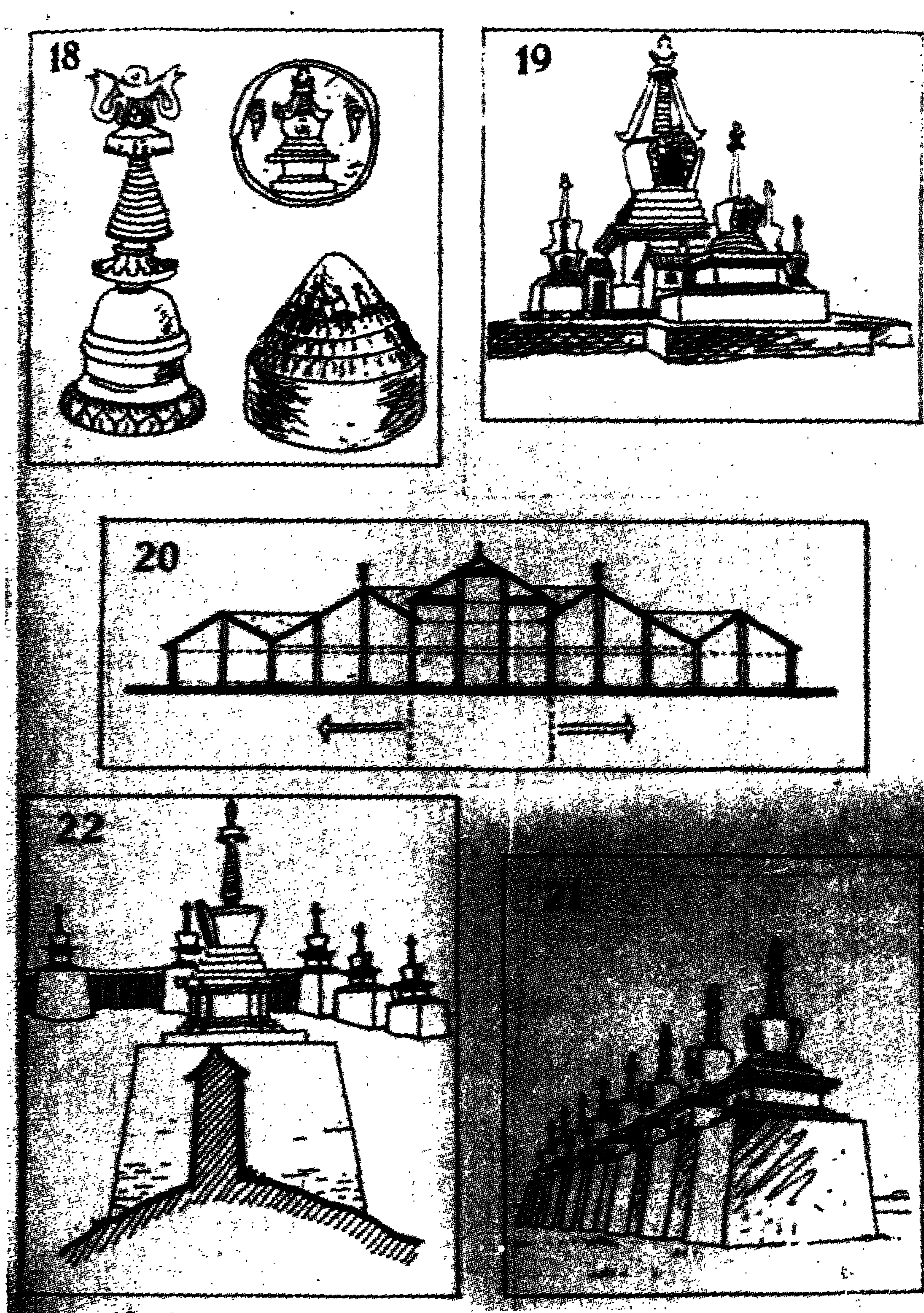
Special small signal towers with niches whose form closely resembled that of *suburgans* were outfitted with night lamps (*zuulyi baishin*).

Eight *stūpas* with ashes of the Buddha are set up in the localities where he preached (one *stūpa* for each locality). But, in Mongolian monasteries, eight *suburgans* are installed in a row, symbolizing, as it were, completeness of the sacred relies set (Fig. 21).

In general the *suburgan* is an ordinary and repeatedly reproduced object of the Mongolian religious architecture. Its main goal is to accentuate directions of the trend and key-systems in the structure of the architectural ensemble.

Together with fixation of routes of approach[25] from main directions (with reference to the cardinal points), common location of *suburgans* was defined, this being the northern border of the monastery.

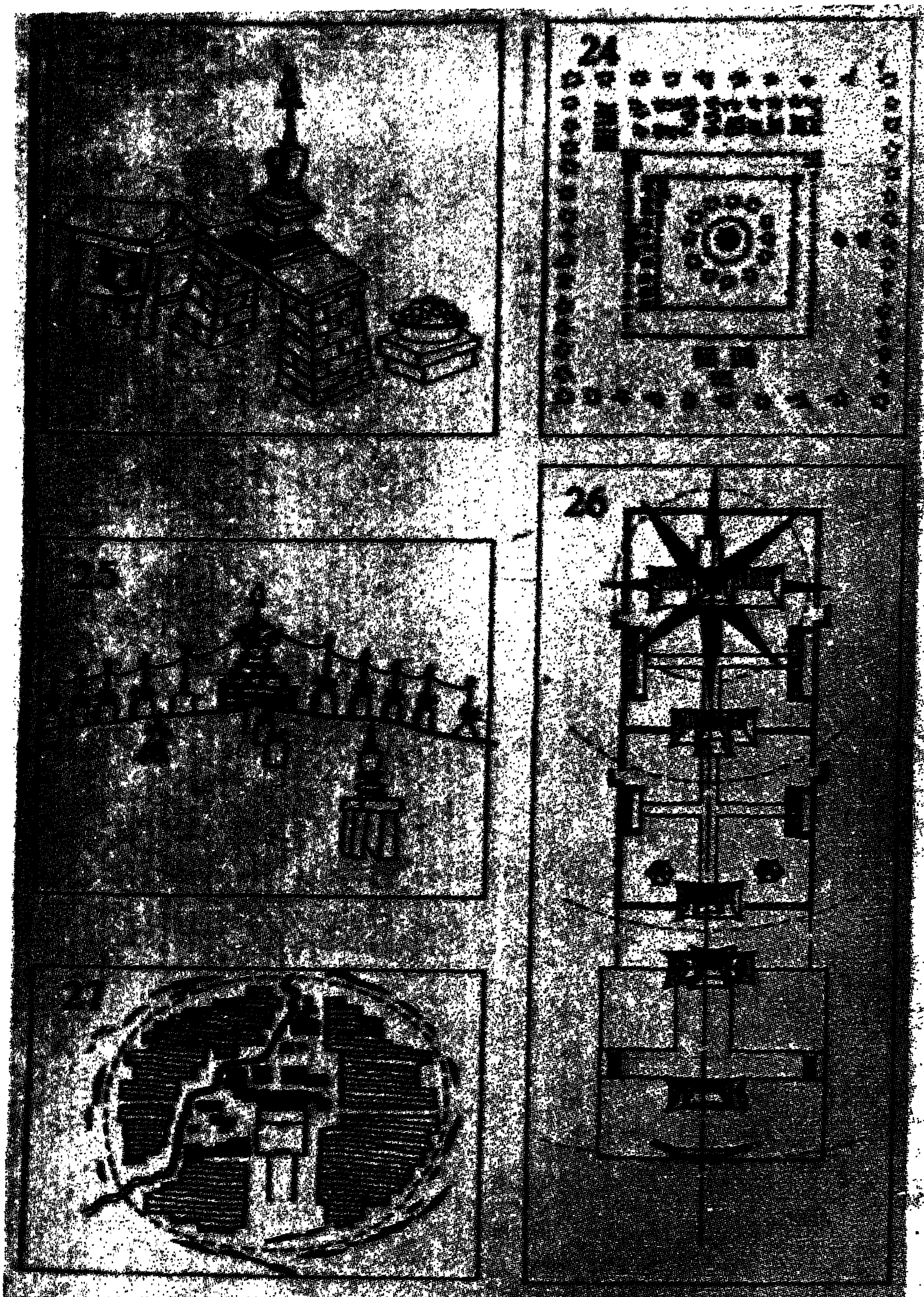
The function of protection and purification is characteristic of the religious architecture as a whole. The *suburgan* is materially and magically a protective shell of the relic, while the umbrella crowning it desperses 'heat of sinful wishes'. The passage *chorten* at Lhassa is installed in the depression between two rocky ridges identified as evil dragons conceived to be supressed and rendered harmless by this *chorten* (2, 132). The "precious necklace" of *suburgans* around the



Figs. 18—22. 18. Ritual objects with representation of Suburgan : Mongolia. 19. Bodhy Suburgan at the Erdene-Zuu Monastery, 1799. 20. Khural Temple (tsogchin) Bat-Taagaan : the Zuun-Khuree Monastery, Urga : Mongolia. 18th-20th centuries. 21. Suburgans of Noen Vangiin-Khuree. 22. Suburgans of the fencing of Erdene-Zuu Monastery : Mongolia, 19th century.

Erdene-Zuu Monastery (Fig. 22) is supposed to sanctify and "enforce" its fencing similar to *chortens* on the circular wall of the Tibetan monastery *Sam-yas*.

Protective and purifying functions characterize in apparent form also those *suburgans* that are located on the approaches to religious centers. This is also true of the groups of *suburgans* screening a monastery complex in the north, as the



Figs. 23–27. 23. Passage Suburgan and Hurde near the Entry to lamyn-Negenii Khurree Monastery, Mongolia. 20th century. 24. Kereksur : Plan, Mongolia. 25. Ensemble of suburgans and obo in the northern part of the menastery : San-Beesiin Khurae, Mongolio, 1910. 26. General Plan of Nogoon-Urgo : Monastery of the Winter Residence of Bogdo-Gegen, Urga, Mongolia, 19th-20th centuries. 27. Scheme of the Zuun-Khuree : Plan with the Route of Circulation of Maidari, Urga, Mongolia. 1911.

wall *yampai* does in the south. The *yampai*, by the way, could be replaced by the passable *suburgan* (Fig. 23).

It may, however, be noted that the *suburgan* played not merely the undefined auxiliary role. Several unique ensembles are known in which big *suburgan* are

present as compositional centres, like the ensemble preserved in the monastery EredeneZuu Boḍh-Suburgan (Figs. 13, 14, 19).

Transitional forms tending to the temple are exemplified by a now non-existent *suburgan* at Zhalhanze[26] around which a two-storeyed pavilion was erected. Yet, in Mongolia, continuous transformation of the *suburgan* into the temple did not take place. Rejecting hypertrophy of forms the Mongolian architects gave their preference to a more natural preservation of functions of *suburgan*-reliquaries in temples of the *shuutenii-urgo* type where the deity sculptures were installed. The most grandiose example of such temple is Megzhid-Zhanraiseg (Fig. 15) with the sculpture of Avalokiteśvara. Sanctuaries Maidari at Urga and in the Ongiin-Gol represented temples of this kind. (Fig. 17).

Functional kinship of the *shuutenii-urgo* and *suburgan* is displayed by tombs of Abat al-Khān and his son Gombodorzhi built as small temples (Fig. 16).

The canonized silhouette of the *suburgan* is abundantly represented in forms of the religious paraphernalia and in decorative and painted topical works of art. Luxuriously imitated *suburgans* are to be seen on *icon-maṇḍalas*. Metallic, wooden and clay models of *suburgans* were placed in temple and domestic altars. Stamped clay tablets (*taats*) with images of burhans and *suburgans* thousands of which filled relic chambers, quantitatively intensified sacral potential of the object in whose "womb" they were placed. Small temple bells (*honho*), were occasionally made in the form of the *suburgan*. Clay cones with the relif representation of 108 *suburgans* belonged to the outfit for the Lamaist ceremony (Dzulain-Khura[1]) conducted in late December every year to commemorate the death of Tsonkhava (Fig. 18).

Compositional and hierarchical ideas incorporated in the *suburgans* exerted a mediated influence on the morphology of the nomadic architecture based on most persistent constructional and artistic traditions. The central position of *maṇḍala* and of its three-dimensional variant, the *stūpa*, supported the logic of the *yurta*-like *tsogchin* (the principal temple) along the line of increase of its volume (Fig. 20).

The number of sanctuary *yurtas*. where *Changhaez*-Khān's relics were reposed was eight, i.e., as many as the number of *stūpas* with ashes of the Buddha. The teaching of rebirths and bodhisattva reflected in vertical but centrally placed divisions of the *suburgan*, was visually and dynamically reproduced in lay-out schemes of monasteries, such schemes being composed along the axis of the "High Road". In horizontal projection, the idea of passage from the sensory world of desires to the blessed void is defined by other means of combining architectural spaces, viz. sacral spheres (Fig. 26), with artistic plastics. But for the first time, it was displayed in *stūpas* and invariably arrived with a view to expanding

composite structures of religious complexes, even on the town-building scale (Fig. 27). As a matter of course, the Buddhist essence is precisely impressed in forms of the original historically motivated experience of Mongols in town building.

Mongolian *suburgans* and religious structures, continuing their functional line, embody the canonical principles of Buddhist postulates (concerning both cosmogony and religious-ethical ideals). But, their realization in the nomadic architecture including stationary and mobile structures was implemented in the forms that met specific social interests of the nomadic civilization, at the same time, being constructively and artistically in agreement with traditions of the national architecture.

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"Bodhisattva" (Buddha) Kaṭrā, Mathura; 1st Century A. D. — This is one of the early classic images of Buddha in self-contemplation and benignant in gesture to mankind (Reproduced from V. S. Agrawala, *Indian Art*, Plate CXIV, Prithivi Prakashan, Varanasi, 1965).

MUSIC

MUSICAL CULTURES OF INDIA AND CENTRAL ASIA: ON THE PROBLEM OF HISTORICAL COMMUNITY OF THEORY AND PRACTICE

T. S. VYZGO AND A. B. JUMAEY

"I would never enclose my house with walls or nail down the windows. I would like to have the cultures' spirits of various nations spreading all over the world overcoming all possible obstacles,—they should not only knock me down"[1]

—*M.K. Gandhi*

The deeper the penetration into the history, the higher seems to have been the astuteness of Gandhi's mind. In fact, throughout its history, India maintained the closest contacts with many nations and countries. Nevertheless that he never shadowed the distinct originality of Indian Culture. For almost six hundred years the waves of different civilizations had been enriching Indian musical culture with achievements of other civilized countries flowing into India through its north-west gates.[2] Such a crossing of cultures with various roots has resulted in India's possessing "both the features of north-west outpost of Indian world and the south-east outpost of forward Asian world."[3] The political situation in the region facilitated significantly the establishment of cultural exchange with Central Asian countries, took place among with the consolidation of Akhamenid Persia, the empire of Alexander, the Kushana empire and the empire of the Mughals.

There is no denying the fact that wide-scale contacts of Indian people with nations of Central Asian region was pronto influence considerably the whole spectrum of cultural life of the country, including the deepest roots of musical heritage. It is a well-known fact that Indian music has deeply rooted historical sources, e.g. the *Ṛgveda* (about 1500 B.C.) and later collections under the title, the *Sāma Veda.* Considering the antique sources, we may regard the priestly chantings to be the earliest musical roots of Central Asian people.[4] It should be noted that, if the *Vedas* with their various songs and hymns had actually been recorded in one the other form, in similar genres, especially those existing in the Central Asian region, which lay hidden for a number of centuries.

There is a good deal in common between the Central Asian and Indian music, both were based on a seven degree diatone. However, it had been interpreted in quite different ways. The various principle, peculiar to most modal musical systems, resulted in each specific case in varying nuances of degrees. This principle was highly developed in detail in India, the *śruti* system imparted to the Indian music a specific brightness of ringing.

Rather close trends may be observed in certain musical general:—oral-professional (Indian *rāga*, Tadjik and Uzbek *Magom*) and popular ones (song—dialogue; song-dance), in some social functions.

A number of common traits are associated with musical theory and aesthetics, specially in certain types of instruments and musical forms.

I. Historical Communality of Certain Types of Indian and Central Asian Musical Instruments

In one of the earlier Sanskrit treatises on the theory of painting (third-fourth century B. C.) the influence of one type of art on the other has been well described, a line along with a certain modification took place has also been presented. It may be noted that, in order to create a sculpture, one should know the laws of painting, which in its turn is considered to be impossible without an idea of dance, and the later could only be understood to relation to a deep understanding of instrumental and vocal music. The vocal music was considered to be "the beginning and the end of all arts."

Hence, according to Indian aesthetics of the middle ages, the instrumental music is but a second in the hierarchy of arts. In every aspect, it is subordinated to vocal music, considered to be a lively into nation united with a sonorous way of presentation. It is worth mentioning that the great thinkers of Central Asia, like al-Fārābī and Ibn Sīnā were also convinced of the primacy of vocal music. Though not denying the role of instrumental music, they considered vocal music to be the primary manifestation of a person's musical feeling, the most natural and perfect type of musical creative activity.[7] However, along with the acknowledged primacy of vocal art, the musical theory, both in India and Central Asia, had developed the system of keys and modes, the structure of intervals and some other pure theoretical aspects based on the data of instrumental music (the techniques used when tuning the instruments, the methods of division of strings into parts, the positioning of cross-pieces on the bridge of plucking instruments, etc.).

This is, in fact, an evidence of the high level of development inherent to musical instruments of Central Asian countries. Another evidence includes numerous representations of musicians in the cultural monuments of the past. Among them, special mention may be made of the famous reliefs of Gandhāra (northern India) and a stone frieze on a shrine of Buddha in the town of Yartam (south of contemporary Uzbekistan).[8] These monuments go as far back as the time of Kushāna empire comprising Central Asia and northern parts of India when there was very close contacts between these region.

An important role of music in the spread of Buddism is well-known and the music peculiar to this cult (instrumental one in particular), was also spreading. Depending upon the environment in which the rituals were spread, the musical

instruments were subjected to certain modifications. For example, the instruments of the Yartam frieze included a harp, a lute, an avlos, a drum and cymbals.[9] The group as if typical for Buddist music is, in fact, a certain deviation from traditional forms, i.e., a harp is not a curved instrument like the one on the monuments of Bārhut (second century B.C.), Sānchi (first century B.C.) or Gandhāra (first-second century B.C), but an angular one peculiar to local Central Asian type.[10] It was precisely this type of a harp that was fixed in terra-cotas of Sogd and Bucktery.[11]

A lute of Yartam (a short lute) is a bit closer to Indian musical instrument with a shorter bridge and specifically varying shape of a body. This variance become clearly noticeable, while analysing the historical monuments. Even monuments closely connected in time and distance contain a wide range of differces in the shape of a lute, e.g., a stone lute from Yartam and a terra-cotta one from Dalverzin-Tepe (Northern Bactria, first century B.C.-2nd century A.D.).[12] The instruments fixed in Gāndhār reliefs may also be referred to as short lutes, though they largely vary in shape. Not rarely they have a narrow, elongated body developing into straight bridge having five beads, which are used for tuning the instruments.[13] There was also another lute very close to be instruments of Sogd and northern Bactria,[14] the common features being a comparatively large pear-shaped body (with varying dimensions) a short bridge developing into a turned-back head with beads. These features persisted in the development of an instrument, and, under the Arabic name of *ud*, had fascinated the Mediterranean region and even survived during the post-Renaissance period in Europe.

The monuments of Gāndhāra, Afrosiāb, Dalverzin Tepe and Merv[15] have the earliest representations of a short lute, that lead us to consider the Central Asian region to be a cradle of short lute, which later became wide-spread.

The other three instruments represented on the Yartam frieze gave but different answers to the problem of connections with India. For example, the double-sided drum in the form of a keg is one of the oldest musical instruments of India, represented on numerous monuments, which is still widely used by musicians.[16] The spherical cymbals fixed on the Yartam frieze are similar to the instrument in the hands of a dancing priestess of Nisa (second century B.C.).[17] It is possible that both India and Central Asia received it from the countries of forward East, particularly from Sumerian empire, where it was used in rituals as far back as third century B.C.[18] Finally, the last Yartam instrument, *an avlos*, is not at all natural to India, since some representations of this instrument are found on certain monuments of northern Bacteria and Purfey.[19] The representation of an *avlos* in the Buddhist shrine, which had not even the slightest connections with the instrument, may be accounted for by its existence in Central Asia, where it had become wide spread.

The instrument common to both India and Central Asia, might have been a

transverse flute, which was not as wide-spread as the longitudinal one. More interesting is the fact of its existence in Indian culture (Sānchi, Bhārut and Gāndhāra), as well as in Central Asian region. The terra-cota flute of Central Asia has a shape not so strictly fixed as the Gāndhāra one, but the identity of these instruments leaves no doubt whatsoever.[20,21] A complete replica of Gāndhāra representations is fixed on the Sogdi silver cup with an image of a feast (sixth-seventh century A.D.), with two monkeys playing on a transverse flute and sandglass-shaped drum.[22] Similar positions of fingers of musicians on the instrument-body provide a sufficient ground to believe that these flutes had several (most likely six) holes. A small sand-glass-shaped drum is also characteristic of ancient and mediaeval Indian culture.[23,24] As to the musicians represented on the Sogdi silver cup, it should be noted that they do belong to the Indian images. A monkey is an animal blessed by the Buddha, appearing in many Indian ballads and in sculptures of Sānchi and Gāndhāra. These images came from the Indo-Kushana regions into the northern Bactria and Sogd and then were used by local artists. In this respect of special interest are the Central Asian terra-cotta monkeys found in the excavations at Barat-Tepe[25], Zar-Tepe[26] and Gissar.[27].

All musical stages (both in Gāndhāra and Yartam) are distinguished for a group performance. The Gāndhāra reliefs represent large instrumental groups, including harps, lutes, flutes, trumpets and drums. The Yartam frieze represents somewhat a smaller group of instruments. In view of the close contacts existing then, it would be natural to suppose that group performance was first inherited by India, then by Bactria and Sogd.

The influence of Greece and Rome, obviously present in Bactrian and Gāndhāra sculptures, was not felt in the sphere of music, neither in the manner of playing music nor in group composition. Farmer seems to be right when he said that, in the field of music, the Greeks had taken from the East more than they had given to it.[28]

The Indo-Buddhistic trends may well be found in the culture of Pendzhikent —a Sogdi town situated not far from Samarqand. The internal walls of the Pendzhikent buildings were widely covered with representing cult rituals and fashionable motives. It is here that the typical paintings of Buddhist instruments may be met: a curved harp, a lute with a narrow and highly elongated body, a flute of Pan.[29] It is a very difficult problem to find out a close analogy to the musical instruments of Pendzhikent among the monuments of Central Asian fine arts. On the other hand, a commonality and sometimes even an identity of the types of instruments as well as the manner of playing, may be observed when comparing the Pendzhikent paintings with those discovered in the Buddhist shrines in Sinkiang.[30] Close connections between Sogd and eastern Turkestan with several Sogdian colonies existing therein, are well-known from literature.[31] These connections were significantly supported politically. In the epoch of the Kushāna empire, which encompassed parts of Cen-

tral Asia, North-West India and Sinkang, constituted one state. The Indian musical culture, influenced by more ancient civilizations in ancient times and Middle Ages and itself influenced the culture of many people of Central Asia and, again beginning from the eleventh century, it found its if greatly influenced by the art traditions of the Muslim world. A new musical style originated in northern India, combining a good deal of vocal and instrumental musical elements of Persian, Central Asia and a number of Arabic countries. A new wave flowed into the Indian culture during the reign of Mughals (16th-17th centuries). In the court of Bābur in Delhi and his successors music ranked very high. Seven "Sections" (groups) were organized representing musical culture of differnt regions, of the Empire. Melodies and rythms, genres and, closely connected with them, various instruments peculiar to Central Asian countries became widespread in India during those days. In the court of Bābur, a new musical instrumental band, unknown before in India, was organized comprising *karnai*, *surnai* and large *nagoras*. Along with profound inclination towards music and musical instruments of Central Asia, wrote Marcel Dubois, was a natural feeling of the Sovereign, who preserved nostalgia for tulips and roses of Fergana.[32]

The orchestra of harems of Mughals was composed of different instruments including both Indian and Irano-Central Asian instruments: various types of lutes, *Vina* rubāb, a cylindrical drum, a keg-shaped drum and cymbals. Under Jahāngir this orchestra was increased with an angular harp introduced into it. This instrument was but a stranger in India before the Mughals.[33] The cylindrical harp so dearly loved in Maverannahr in Middle Ages found its limited use in the Mughal court.

If we compare the Mughal minuatures with those of the earlier schools at Gerat, Samarqand or Bukhāra, one can easily detect a complete identity of an instrumental group composition, as well as of the manner of playing music. Settled functions of two types of instrumental groups were typical for those times. One of them, the "chamber music," was composed of string instruments with cymbals and longithoinal flute added; while another was of wind and percussion instruments, intended for playing outdoors. The latter may well be observed on the miniature called "The ceremonial meeting of Bābur by the population of Samarqand", in which the musicians seated on the city walls significantly amplified the atmosphere of the event by mighty sounds of their instruments (*karnai*, *trumpet*, *surnai*, *nagora*).[34] Another miniature of the Mughal school "Celebrations on the occasion of coronation of Jahāngir" portrays a similar group accompanying the ceremonial procession. At the open gates stood an elephant with a musician sitting on its back and playing an cymbals,[35] a scene quite similar to those represented on Iranian and Central Asia miniatures, the only difference being an elephant instead of a camel.

The "chamber music" groups are by no means so similar in composition,

which in many cases is rather diversified. The Mughal, miniature "The feast of Bābur in Kābul on the occasion of the birth of *Khumajum*" is rather a typical one in this respect with the musicians playing in front of the Sultan sitting above on the platform. The group comprises a string instrument combining the signs of an *Ūd* and a rubāb (a large deep body with slightly indicated beads arranged near the bridge), *nai* (longithoinal flute), *surnai*, small double *nagoras*, *doira* and castanjetes (in the hands of a dancer). Similar scenes may well be found on the miniatures of the schools of Gerat, Samarqand Bukhārā (16th-17th centuries), though among the string instruments were an *ūd* and angular harp; sometimes a *gidgak* was also used.[36]

II. Some Aspects of Interaction of a Maqamat and a Raga (Based on the mediaeval literary sources)

The words *maqam* and *maqamat* are used here as symbolic terms to denote the mediaeval mode systems without revealing specific national peculiarities (an Uzbek-Tadjik *maqom*, an Uigur *muqam*, an Azerbaijam *muqam* etc.). Nevertheless, one should bear in mind that the terms *maqam* and *maqamat* assumed their final form in the mediaeval period (16th-19th century A.D.)

The Central Asian-India musical connections which were forged in the ancient times had resulted in creation of common principles in aesthetics and theories necessary for all analysis of a *maqama* and *rāga*. Lately, specialists are tending to recognize the typological commonality between the Indian *rāga* and *maqamat*, the Uzbek-Tadjik *maqomas* in particular, although these have been analysed and examined in detail much earlier.

An investigation of the Indian culture, history, religions, music etc., by outstanding Central Asian scholars and musicians significantly facilitated the development and consolidation of musical connections. For example, Abū Naṣr Fārābī in his "Large Book on Music" refers to the traditions of Indian people.[39] The scholars known under the name of "Brethern of Purity" (mid-ninth century A.D.) also referred to Indians.[40] Further, Abu Raiḥān al-Bīrūni, described with great love and respect the culture and tradition of Indian people,[41] Such endeavours helped in the appreciation of musical cultures in a mutual way. Nevertheless, the idea of comparing these two phenomena, i.e, *maqama* and *rāga* could not be achieved spontaneously, except as a result of direct interaction of the cultures.

This interaction was specially intensive in northern India which was closely connected with Central Asia. It is precisely here that the Muslim and Indian cultures had found their cross-cultural synthesis. Jawaharlal Nehru once mentioned that such a synthesis "had a special indication in music, which though preserved ancient Indian classicial traditions, was given a diversified impulse".[42]

The Indian musicians, in their turn, directly influenced the musical culture of Central Asian people. It is a new, though sufficiently well-known that Muḥammad Ghaznavid generally known for his brutality in revaging the Indian towns, brought back with him apart from craftsmen, the musicians as well as dancers and settled them in his native town Ghazm[43] where there was a special block known under the name of *Shādiābād* (the town of merry-making) in which lived the musicians.[44] We may suggest in this very case a direct contact of musical cultures of various nations occurred between India and Central Asia.

In the thirteenth century the Tartar-Mongol hordes invaded Central Asia. Many scientists, poets and musicians found protection in remote regions like India, where they were given proper facilities to continue their creative work. In turn, they influenced the musical culture of India. Among them was a father of the great Persian poet of India Amīr Khusraū (1253-1325). He was also considered to be a musician and a musical theorist. Jawaharlal Nehru aptly wrote that he could not remember another example of songs, written six hundred years ago, which continue to be sung without any modification in the text.[45]

Khusraū is known to have written a treatise on the history and theory of music. In his *ghazals* and poems, *Hamsa,* he highly praised the profession of musician and his musical art. In a small verse entitled "Advantage of verse over music", the poet has shown the potential in respect of these two closely connected arts.[46] These ideas significantly influenced the music theorists in Central Asia, the musician from Bukhārā, Darvish 'Alī Changī in particular, who used the text of above-mentioned verse to support his own aesthetic outlook.[47]

Khusraū enjoyed an enornomous respect among the theorists of music like Aristotle, al-Fārābī and Ibn Sīnā. The development of a new type of instrument *Sitār* and teaching Indian theorists to play on instruments, was closely connected with his name.[48]

According to some sources, Khusraū participated in the development of new musical genres, i.e., *kawl, farsi, tarana.*[49] Even among the musiians of Bukhārā of later epoch, he enjoyed prestige, which tact is confirmed by the "Treatise on Music" by Darwesh 'Alī Changī.[50] The latter wrote that he had used several ideas of Khusraū who, in his opinion, possessed "all perfections in the musical science".[51]

The poetry of Khusraū is an unfailing source of data on Indian and the Central Asia musical culture, instruments and their expressive means particular types of melodies and generes as well as the expertise of musicians.[52]

Khusraū used the terms *rakh* and *parde* in order to denominate the modes, the most frequently used term was *mode ushahaq.*[53] It may be noted that Indian

musicians are inclined to connect the name of Khusraū with the spreading of *maqams* in In India, as indicated in the work of Narayana Menon.[54]

However, there are indications that the penetration of the *maqamat* system into India had occurred a little earlier. In a small treatise on the music of the Khurāsānī musician, Muḥammad Nīshāpūrī (list of papers of 1265 A.D.) has been described a system of twelve modes (*parde*), six *shu'bes*, eighteen *bangos* prevalent in the Middle East. An Indian mode (*parde-ij khinduvan*), which is recommended to be performed immediately before sunset is also mentioned in this work.[55]

It is possible, that, at the beginning of the fourteenth century, the system of twelve modes (*parde*) finally evolved and assumed its own features. There are indications to this effect in a treatise by Zija ad-Dīn-Nakhshabī *Ṭuṭī-nāma* (The Book of a Parrot) written in 1330 concerning women's guile and cunning.

For Nakhshabī, India was his other Motherland. He was born in Nakhshab (contemporary Karshī situated in the south of Soviet Uzbekistan). However, in last quarter of the 13th century, for unknown reason he settled in India.[56] In his work Nakhshabī presented quite interesting data on the system of twleve *pardes* (as well as on the musical culture as a whole). Nakhshabī once wrote: "One should know how many basic and derivative modes are used, how Indian modes constitute one Persian mode, and how many Indian modes may be derived from a single Persian mode. . . ." "One should also know the name of the inventor and founder of this science, which melodies are adopted from Arab scholars and which have been created in Persia".[57] No doubt, Nakhshabī while speaking of Persian modes implied those that were wide-spread in the Middle East including Central Asia. He has given a list of the following twelve modes (*parde*): *Rakhad, Chini, Rast, Nausilik, Nikhavand, Ushahaq, Khidgaz, Iraq, Mukhalif, Bakhriz, Zir-i buzurg, Zir-i* Khurd.[58] Three of these pardes *Rakhad, Chini, Bakhriz*, are not at all mentioned in any other known sources of the made system (e.g. treatises of Kai-Kavus, Safī ad-Dīn Urmavī, Muḥammad Shirazī, Āmulī Ábd al-Qadir Margī, 'Abd ar-Rakhmān etc.). They are probably an Indian derivative of 12-mode system.

In the musical art of Central Asia of 14th-15th centuries, various forms were actively developed, which were directly related to the *maqamat* system development. A good deal of new genres appeared, e.g. *pishrav, kor naksh, savt, amal* etc. . . . A specific characterstic of some of them is the use of Turkic, Persian-Tadjik, as well as Arab poetry. It is possible that such an original musical-poetic genre *rikhta*, performed in Hindi, appeared at that very time. It was first mentioned in some central Asian treatises on music in the 16th-17th centuries. The Bukhāri musician and theorist of the 16th century, Najm ad-Dīn Kankabī Bukhāri wrote of this genre, as well as some anonymous authors, musician Baqiyaī Nainī and Darwesh 'Alī Changī.[59] The *rikhta*, like other genres, was written in modes of the 12-mode

system (*maqams*). This phenomenon is directly related to qualitatively new level of interaction between Indian and Central Asian musical cultures.

A separate and, perhaps, the brightest chapter in the history of these connections, is directly found in Mughal India. The founder of this empire, Bābur, had with him a complete staff of musicians. He might have had Indian musicians as well.[60] An influx of musicians was significantly increased, from Bukhāra particularly, during the region of Humāyūn (1530-1556), and later, during the reign of Akbar (1556-1605). As stated by Darwesh 'Ali, an excelent singer and a native of Sogd, Maūlānā Qāsim Kakhī, and Yūsuf Maudūd Dutārī came to Humāyūn.[61] The emperor was fascinated by the latter's music.

Poets and musicians, Qāsim Arslām and Khwāja Ábd al-Qarīm Qādī, moved from Bukhārā to India and were given shelter by Akbar.[62] All of them knew the *maqamat* system and were the exponents of its traditions in Central Asia.

Finally, the peak of the centuries-old musical culture of India and Central Asia in the late Middle Ages, was the development by their scientists of common problems on professional musical art (*maqamat*, *rāga* rythm, genre, instruments, problems of aesthetics, etc). A number of anonymous authors in some treatises on music ("The maqams that are well perceived by certain social groups and what nation they belong to") present several recommendations on how to perform 12 *maqams* and their *shu'be*. Some of them believe the *maqams*, *Chachrgah* and *Rakb*, to be closer to Indian people (*mardum-i-Hind*), other considers that *Buzurg* and *Buslik* are performed in India.[64]

Ṣafī ad-Dīn Jurdganī reports that Indian people perform the *Maqams*, *Khumaum*, *Uzzai*, *Nahuft* and *Zangule*.[65] These facts point to the final formation of the common sphere in creative activity among the peoples of India and Central Asia. It is possible that the Central Asian musicians created certain musical pieces under the influence of Indian musical art. For example, in Central Asia, among popular rythms are *uṣūl* "Indian circle" (*daur-i hindī*[66]), Indian musicians created many rythms[67] like Kungrī are of Indian origin.[68]

In some Persian sources, written in India at that time, special chapters had appeared, which deal with the procedures for campiling the *rāgās* and twelve *magams*, *tālās* and *usūls*. These works were created by both Indian and Central Asiatic musicians. Of special interest in this respect is a treatise on music of a poet, philosopher and musician, Baqiyai Naini (17th century). He must have lived for sometime in Central Asia, since his works contained an indication of a good knowledge of musical traditions peculiar to this region.

When he described the *maqam* system, he base himself on the works of Najm ad-Dīn Kaukabī Bukhārī. A small treatise in prose and verse was called

Zamzame-ij Wahdat (The Melody of Unity). It comprised an introduction, six chapters and a conclusion. The author was captivated by the desire to write the paper on the commonality of Indian and Persian melodies (the mediaeval scholars called the music related to Central Asia, a Persian one) only after he had moved into "a wonderful state of *Hindūstān*" and "with ears of mind, perceived the tenderness of that flower-bed".[69]

Six chapters of a treatise by Naini are entitled as follows:

He quoted certain Indian terms equivalent to the *magamat* terminology (low and high parts of a mode).[70]

The method of correlation of *maqams* and *rāgās* was suggesed in the nineteenth century by Ghiyāthsuddin Rāmpūrī, Wājiu Álī, etc. Rāmpūrī, in his encyclopaedic dictionary, "*Ghiyāthal-Lughat*" (completed in 1826) analysed the performing of *maqams*, 17 measures of *usūls*, 12 *maqams*, 6 *akhangs*, 48 *qusche*, *maghams* known to "non-Arab peoples". Having completed the analyses of rythms, which, in his opinion, were called *tāl*-by Indian musicians, he had set a certain time for their performance.[71] While analysing the titles of separate *maqams*, Ghiyāthsuddīn quoted the corresponding Indian ragas and refered to Indian scientists like Bekhondī.[72]

A similar composition as well as content, can be observed in the 26th chapter entitled "On the Science of Music" in the encyclopaedia, *A Sunrise of of Sciences and List of Crafts* by an Indian scholar Wājī Álī, (compiled in 1845-1846).[73] This chapter is subdivided into two sections : (i) "On Persian music"; and (ii) "On Indian Music", preceded by a small introduction.

(i) "On Titles of Persian Melodies and Correlation between an avaze, maqams and shu'be";

(ii) "On Correspondence of some Indian Melodies to certain Persian Melodies and their Titles";

(iii) "On the Rules of Composing and Performing Indian Music";

(iv) "On the rules of Composing Persian Music";

(v) "On the time when Persian Melodies are to be performed"; and

(iv) "On the particularities of Indian Melodies".

Naini was the first among known musical theorists to have analysed *ragas* and *maqams* within limits of a treatise. He seemed to have had no difficulties in analysing the compositions of both Indian and Central Asian musicians and scientists: Rūdakī, Sheikh-al-Rāīs, Ibn Sīnā, Amīr Khusraū, Abd al-*Qadir* Maragī, Kaukabī etc.

Naini compares two phenomena with no formal method and, to a certain extent, discloses common regularities in the science of *rāga* and *maqam*. For example,

In the first section are discussed twelve *maqama* their correspondence with Zodiac signs and the time of their performance; then 74 *shoube,* six *avaze*, 48 *qushe* and some instruments and generes are presented.

In the second section are given the basic definitions of Indian music; analysis of seven basic concepts; *svaras rāgas, tālas*, dances, melodies, composing and performing, etc.

Wājid Ālī also refered to the savants of Central Asia and India like al-Fārābī, Ibn Sīnā, Gypal etc.

Thus, on the one hand, the system of twelve *maqams,* which developed in Central Asia the Middle East, penetrated into India and spread therein. Having acquired its specific features, it did not retire on to itself. Till the late Middle Ages it developed in constant contact with the Central Asian system. Each was feeding the other with mutual influences. On the other hand, the culture of *rāgā* inherent in Indian music, developed its contacts with *maqama*, both of India and Central Asia. The relations between Indian and Central Asian *maqamata* might have given rise to some regulations regarding the performance of *maqams* among Indian people.

Rāga and *tālās* in India, and *maqams* and *usūls* in Central Asia, are the highest achievements of music and, in this very sense, they are similar.

Wājid 'Ali stated: "We are to know that *maqam*, according to Indian terminology corresponds to *rāga* and *shoube*—to *rāginī*"[74]

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INDIAN REHTA IN CREATIVE WORKS OF MUSICIANS OF CENTRAL ASIA*

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Bilingualiism happens to be a composition in Persian-Tadjik as well as ancient Turkic languages and, in all probability, assumed its inception along with the very act of vocal as well as musical creations of our ancestors who used to live on the territory of present-day Central Asia. In poetry, like in music, bilinguism enriched itself somewhere in the seventh century. while Arabic became the third language. In creative works of the world-renowned Sādī, exist certain "variegated" *qasids* in which Persian, Arabic and Turkic beats alternated themselves, while in a musical treatise of the composer of the fifteenth century, who remained incognito, there is written a form of *muraṣṣa'*: "This is spoken by him (anonymous writer makes a reference to a theoretician of the fifteenth century Ábd al-Qādīr) and such is the type of composition in which simultaneously merge Arabic, Persian and, at times, Turkic verses. To melodies of such nature one may add words both in prose as well as in verses and, in such a situation, this form is known as a composite. Various kinds of departures are permitted in compositions of such particular genre as well as all types of free fantasy. so that they may produce a pleasant impression upon listeners. Being the era of Amīr Khusraū Dehlavī (1253-1325), the fifteenth century presented the world with compositions in contemporary Indian language in which dominated the Arabic-Persian vocabulary which existed likewise in Asia and which, among the people of the eighteenth century in general, gave rise to the Turkic word Urdu. Apparently in those days. art that prevailed in Central Asia and for ages being congeneric to that of India, has responded itself to new creative heights in the composition of musical works based upon Hindi verses and such compositions were called the *Rehta*. Why was it that they were designated by this particular word and what does *Rehta* imply in reality ?

The true meaning of this word in Persian-Tadjik language implies—moulded or cast, while in a figurative sense, it means minted or polished and has a common root with the verb "*Rehtan*" which signifies to cast or to pour out; to fill in or to spill out. In an explanatary dictionary of Tadjik language of the 9th-10th centuries, a literary terminological elucidation of the word *Rehta* is likewise provided and is interpreted as "prosaical or poetic fragment which is written in two or more different languages". At one time, or another, a comprehension likewise existed known as *Zabān-i rehta* (Rehta language i.e. mixed language, more fre-

*Here an abridged version, concerning certain historical aspects, has been included, as agreed upon.

quently comprising Persian and Hindī. On its part, Indian dictionary, the *Fīrūs-ul-Lughat* gives the word "*rehta*", as an old appellation of Urdū language: "Initially the poetries which were written in this language were called so".

Sayyid Eḥteshām Husain, an Indian researcher in literature, defines, in the 14th-15th centuries, such appellations of this language as "Hindī", "Hindūsthānī" and "*zabān-i-Hindūsthān*" and occasionally in the South as "*Dakhnī*" and "*Dakhinī*". Amīr Khusraū who wrote both in Persian-Tadjīk and in Urdu languages, called it, the *Hindawī* and also, *Zabān-i Delhī* (language of Delhi). Whereas in the mediaeval times only two words were made use of generally, viz, "*Rehta*" and "*Hindī*" of which the former was regarded as a musical term that signified a succession of tones and keys commonly made use of when anyone made references to *poetic* language, the latter one, it seems to us had in view a *prosaic* mode of expression. In this manner, several appellations served as means of defining the languages that were disseminated in one area or the other and existed during one specific period or the other. During the golden age of the Moghul empire, where the court used to be located and troops were dislocated, bazars invariably used to spring up where people used to speak in mixed type of dialect known as *Zabān-i Urdu* or *Zabān-i Urdū-i-Matallā*, so writes Sayyid Ehteshām Husain.

Thus, Central Asian *Rehta* which implied the prosaic and the poetic fragments written in Arabic, Persian-Tadjik or Turkic languages and the Indian *Rehta* as an appellation to poetic language met each other. Gradually in Central Asia, the mixed verses were called *Rehta* which were written mainly in *Fārsi* and Hindī. In this manner the nomenclature of Indian poetic language found its way into Central Asian musical treatises like a name of a certain musical form.

Later, on, in the beginning of the sixteenth century, *Rehta* is enumerated in a group of major musical forms in the creations of composers and performers of Maverannahr and Khorasan on par with *kar*, *kavl*, *amal*, *savt*, *peshrav*, *naksh* and a host of others. A prominent musicians Najm ad-Dīn Kaukabī from Bakhārī, writes about *Rehta* in his work entitled "*Treatise on Music*", containing a chapter on the "Classification of compositions in accordance with distinction of their parts".

One can just imagine *Rehta* of Kaukabi period as some type of vocal composition, the text of which is written in Hindī, i.e. in *Rehta*-Urdu. It differed from *amal* which was composed in either of the three languages—Arabic, Persian or Turkic and, by a description of *amal*, it is possible to define the following characteristics of *Rehta*: the composition should have been made up of *sarkhona* (principal group of a melody), *mienkhola* (middle group) and *bozgooyi* (recapitulative) group; while the cycle of recapitulation (*davr*) is determined by the author (*muṣannif*), the verses of those days ought to have contained some positive definition.

After a period of some 60 to 70 years, in latter half of the sixteenth century, another great promoter of culture of Central Asia named Darvesh Ālī Changī in his *Treatise on Music*, likewise specifies one of the principal distinctive features of Rehta, its textual language, and refers to it as being "Hindi".

Darvesh Ālī Changī was a singer, poet and teacher and his role, as a historian of musical art whose works were absorbed by a whole complex of theoretical accomplishments of his times, is especially noteworthy. He recorded biogrophical data of more than 100 composers of music not only of the past, but of present period as well and left behind for his descendants some of the most valuable information on musical life, repertoire of its performers and patterns of texts of vocal compositions. The records of the works of Darvesh Ālī Changī are preserved in the State Archives of Manuscripts in Leningrad, Tashkent, Dushambe as well as in private libraries of different residents of Bukhārā and Samarqand.

Darvesh Āli Changī, however, does not provide any structural description of the artistic functions of *Rehta* and, as such "One should keep in view that Rehta, as is produced in Hindi, should be referred to as such". These words of Darvesh Ālī only confirm that he speaks of the Indian origin of the titles of musical compositions of such nature.

We come across, in the tretise of Darvesh Alī, certain facts of his personal contacts with musical world in India and Central Asia, during the fall of the 16th and the beginning of the 17th centuries. Yūsuf *Madūd* was so proficient in playing on *dutār* that, while listening to his music and singing at mejlis of Shāh Takhmaspa Humāyūn became so absorbed in it that he carried the former to India. In 1555, Humāyūn returned to India from Irān (where he fled after being defeated by Sher Khān) and, in all probability that was precisely the time when *Madūd* Dutārī was carried away.

Kāsim Kahī was a poet and singer who was gifted with a voice of exceptional beauty and, was reputed as a person of immaculate standing—"his admirers revered his kind disposition just like they cherished their own souls'. An oral folk story, which Darvesh Alī once heard for one of his mentors, narrates a legend about the miraculous powers of Kāsim Kahī voice, and his singing entreaties, by which he succeeded in a rain-fall which lasted for ten days. Kāsim Kahī likewise departed for India during the days of Humāyūn. Not withstanding all this, the number of people who left for India from different towns of Maverannahr and Khorasan grew steadily during the reign of Akbar.

Darvesh 'Alī Changī informs us that four talented musicians left the country because in their hearts they nourished "a dream about India". They are: Hoja Hatib from Karmina, a composer of music, singer and poet; Kāsim Arslān, a calligrapher and poet; and Vasilli Merwī who hailed from *Badakhshān*.

Even so, Darvesh 'Alī scantily describes the musical *Rehta* of his times even though he delves so minutely on points relating to tune, rhythmics and emotional functions of the other types of formulations of musicians. Here we are totally at straits. However, in the middle of the 17th century, 20 or 30 years after the death of Darvesh 'Alī Changī, a certain Bakiiya from Naini. who migrated to India, wrote a treatise called the "*Zamzama-i Wahdat*" ("Quiet Melodies of Solitude"), in Hyderabad. In this work, he provides us with an interesting information with regard to *Rehta*, and requests his future readers to take into due account the fact, that Hindi and Persian melodies are quite akin to each other.

The foregoing are the initial observations in respect of *Rehta*. Perhaps it is too premature to arrive at any definite conclusions in this particular article on the evolution of *Rehta*, the changes in its artistic aspects, or its aesthetic functions. It is desirable, indeed necessary, for the Indian and Soviet scholars to study these aspects, apart from their narrow specialized interest. Such a study would throw more light on the Indo-Central Asian cultural contacts and the pages of the history of culture, that were written by musicians of both the regions in their passionate desire to come closer and develop mutual understanding among themselves.

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